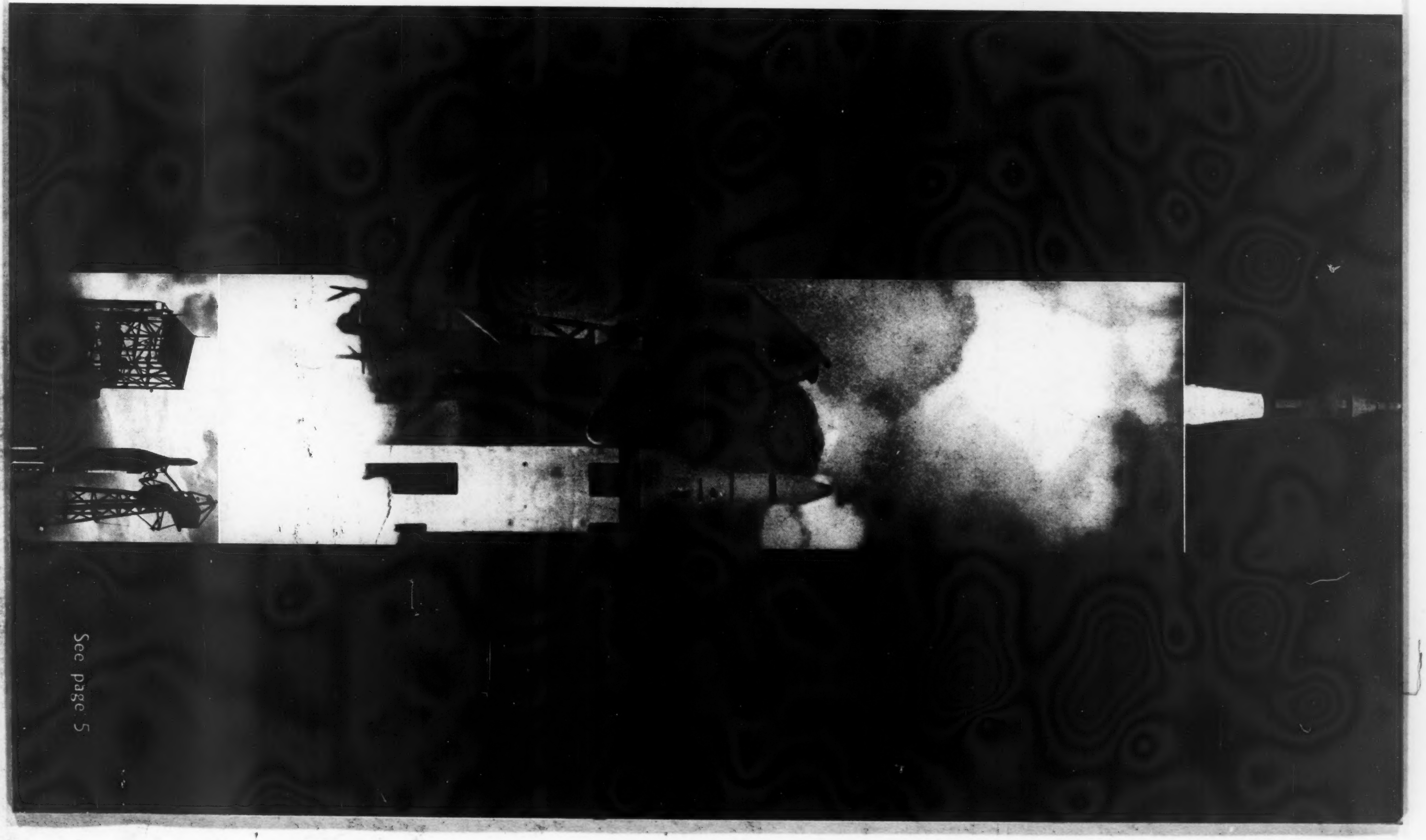
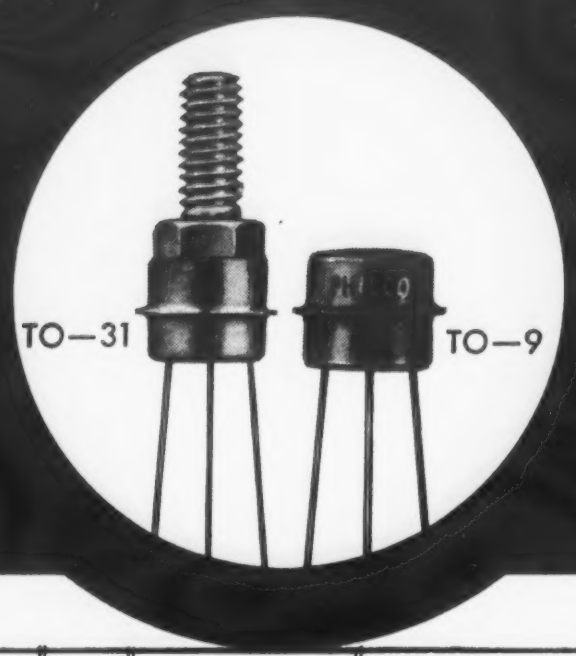
June 1959

SIGNAL



See page 5

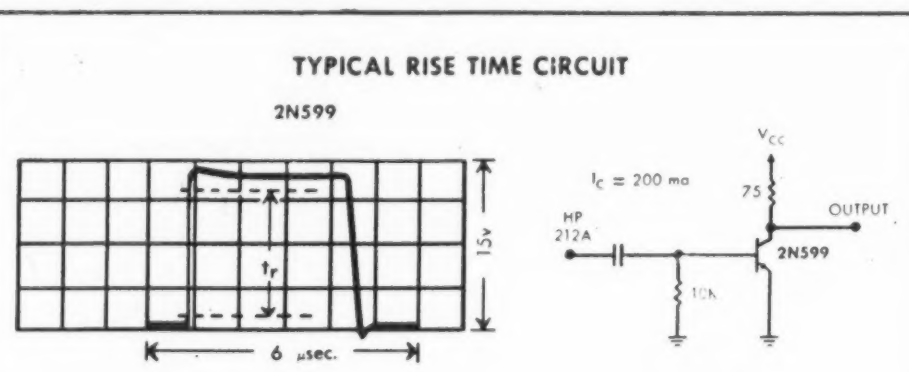
A complete family of Medium Frequency Transistors



Type	Outline	Max. Readings			General Performance		"ON" Switch Performance	
		P_T mw	V_{CB} volts	I_C ma	Min. $f_{\alpha b}$ mc	Typical h_{FE} $V_{CE} = -1v, I_C = -100$ ma	Max. V_{CE}	Max. V_{BE}
2N597	TO-9	250	45	400	3	70	0.2	0.34
2N1123	TO-31	750*	45	400	3	70	0.2	0.34
2N598	TO-9	250	30	400	5	85	0.2	0.34
2N600	TO-31	750*	30	400	5	85	0.2	0.34
2N599	TO-9	250	30	400	12	105	0.2	0.34
2N601	TO-31	750*	30	400	12	105	0.2	0.34

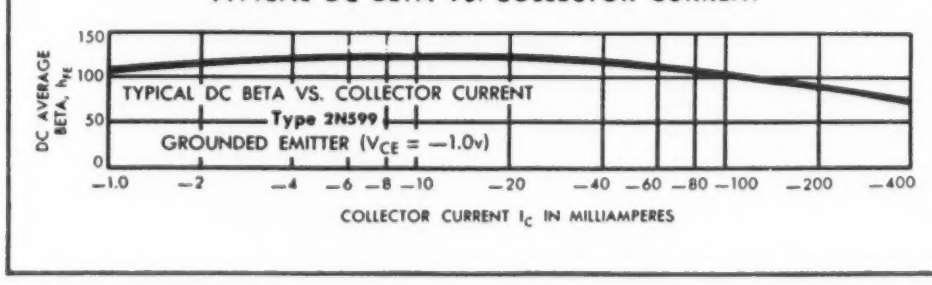
*Peak Dissipation at 25°C = 1 Watt

TYPICAL RISE TIME CIRCUIT



SWITCHING TIMES — TEST CIRCUIT

TYPICAL DC BETA VS. COLLECTOR CURRENT



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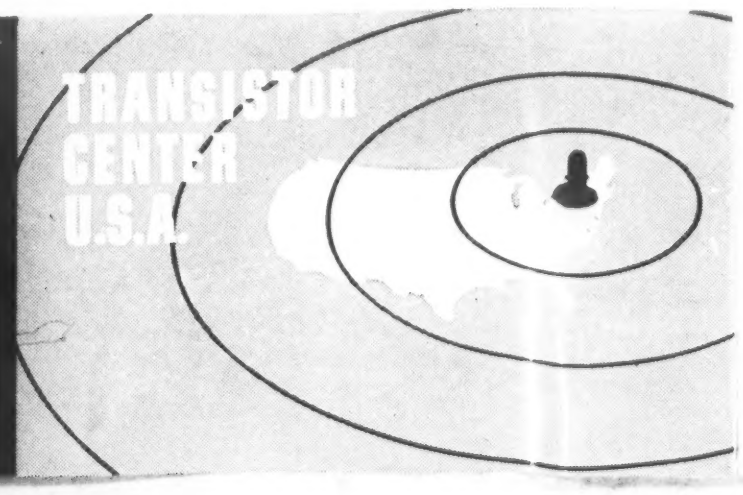

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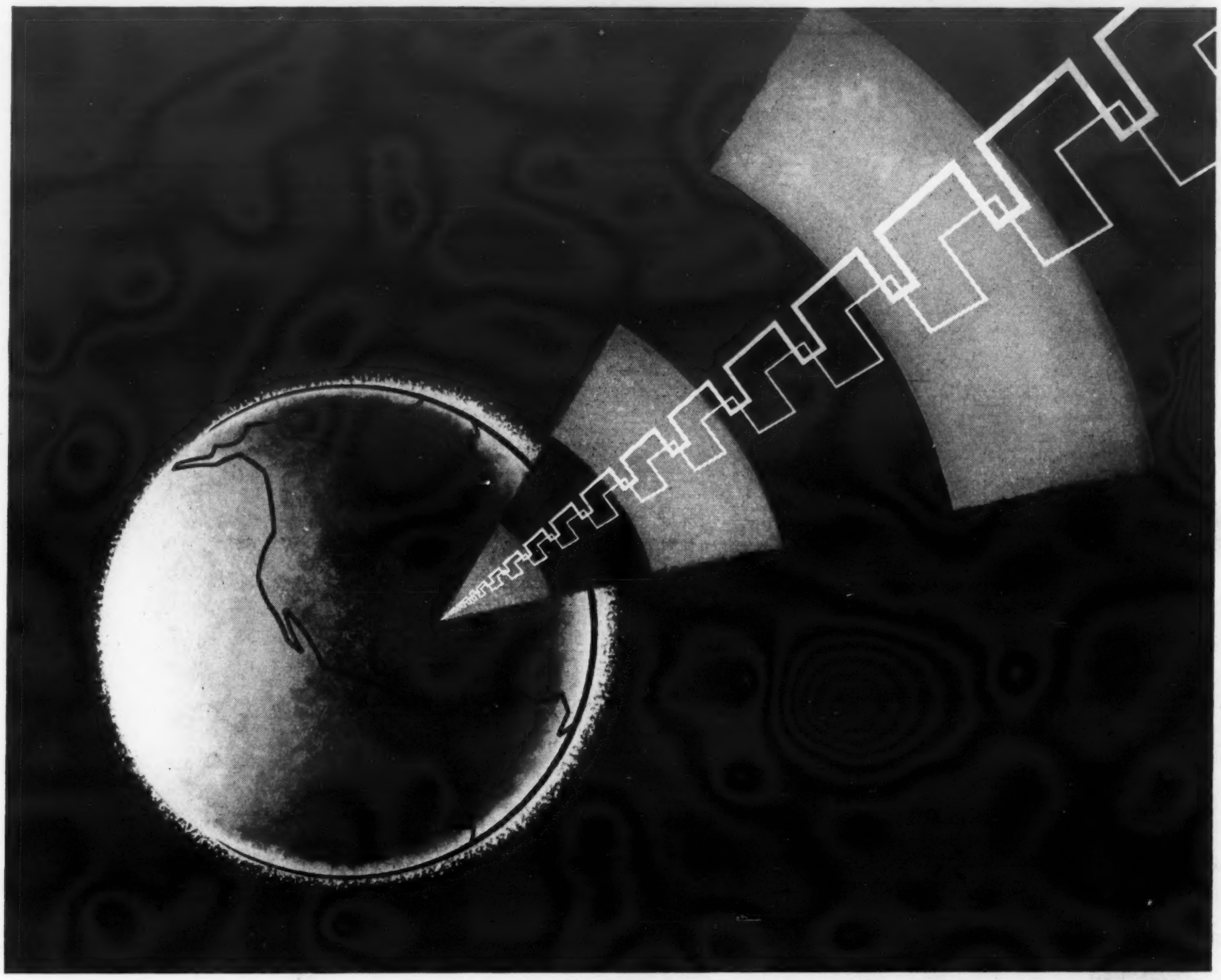

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BPA

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DEPARTMENTS

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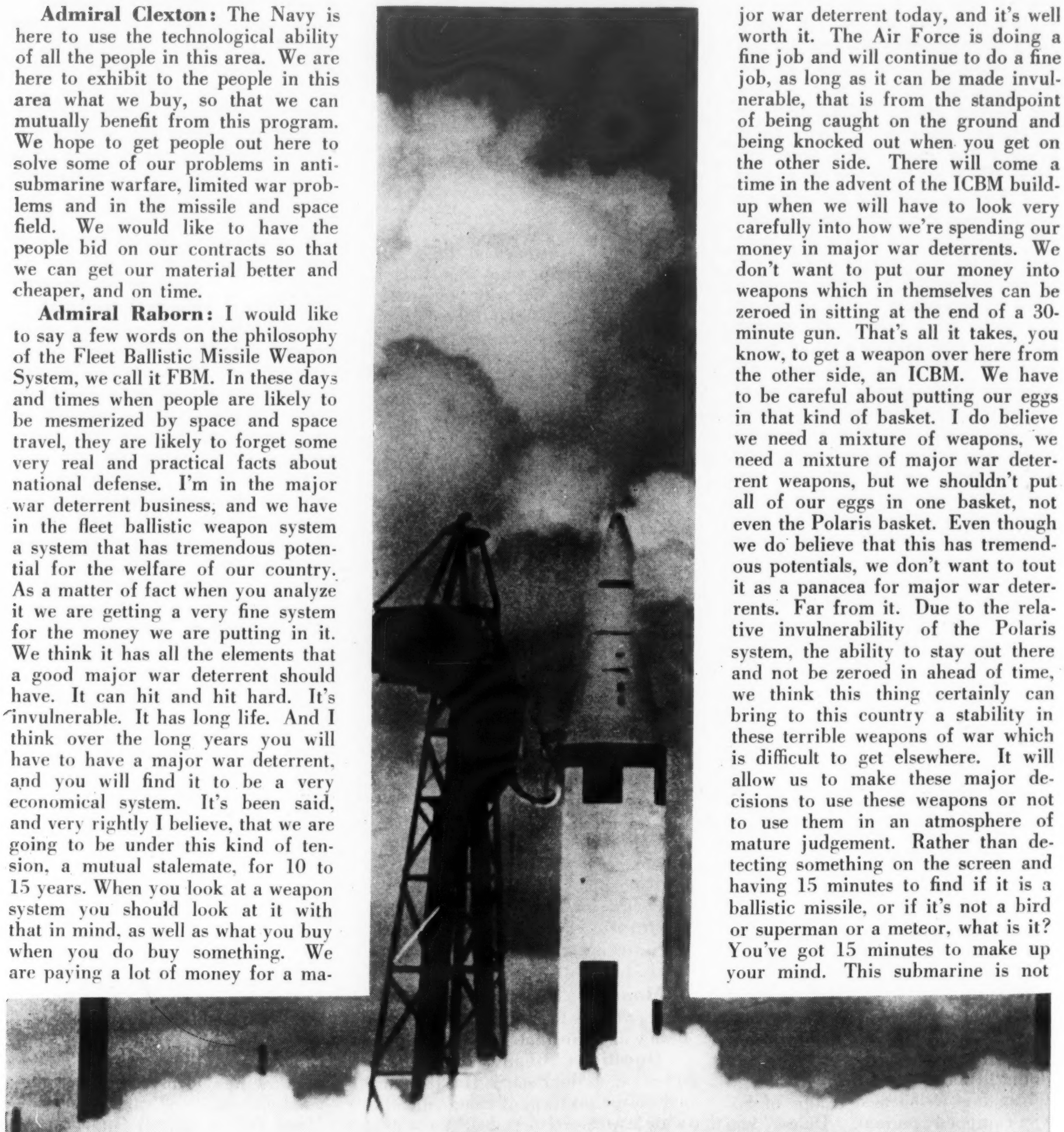

(Polaris AX-1 flight test vehicle begins developmental flight.)

POLARIS—THE FLEET BALLISTIC MISSILE WEAPONS SYSTEM PROGRAM

as presented by

Vice Admiral Edward Clexton, USN
Rear Admiral William F. Raborn, Jr., USN
Rear Admiral Jack Monroe, USN

Based on an interview by the Press at the Western Space Age Conference on March 6, 1959, in Los Angeles, California.

Admiral Clexton: The Navy is here to use the technological ability of all the people in this area. We are here to exhibit to the people in this area what we buy, so that we can mutually benefit from this program. We hope to get people out here to solve some of our problems in anti-submarine warfare, limited war problems and in the missile and space field. We would like to have the people bid on our contracts so that we can get our material better and cheaper, and on time.

Admiral Raborn: I would like to say a few words on the philosophy of the Fleet Ballistic Missile Weapon System, we call it FBM. In these days and times when people are likely to be mesmerized by space and space travel, they are likely to forget some very real and practical facts about national defense. I'm in the major war deterrent business, and we have in the fleet ballistic weapon system a system that has tremendous potential for the welfare of our country. As a matter of fact when you analyze it we are getting a very fine system for the money we are putting in it. We think it has all the elements that a good major war deterrent should have. It can hit and hit hard. It's invulnerable. It has long life. And I think over the long years you will have to have a major war deterrent, and you will find it to be a very economical system. It's been said, and very rightly I believe, that we are going to be under this kind of tension, a mutual stalemate, for 10 to 15 years. When you look at a weapon system you should look at it with that in mind, as well as what you buy when you do buy something. We are paying a lot of money for a major war deterrent today, and it's well worth it. The Air Force is doing a fine job and will continue to do a fine job, as long as it can be made invulnerable, that is from the standpoint of being caught on the ground and being knocked out when you get on the other side. There will come a time in the advent of the ICBM build-up when we will have to look very carefully into how we're spending our money in major war deterrents. We don't want to put our money into weapons which in themselves can be zeroed in sitting at the end of a 30-minute gun. That's all it takes, you know, to get a weapon over here from the other side, an ICBM. We have to be careful about putting our eggs in that kind of basket. I do believe we need a mixture of weapons, we need a mixture of major war deterrent weapons, but we shouldn't put all of our eggs in one basket, not even the Polaris basket. Even though we do believe that this has tremendous potentials, we don't want to tout it as a panacea for major war deterrents. Far from it. Due to the relative invulnerability of the Polaris system, the ability to stay out there and not be zeroed in ahead of time, we think this thing certainly can bring to this country a stability in these terrible weapons of war which is difficult to get elsewhere. It will allow us to make these major decisions to use these weapons or not to use them in an atmosphere of mature judgement. Rather than detecting something on the screen and having 15 minutes to find if it is a ballistic missile, or if it's not a bird or superman or a meteor, what is it? You've got 15 minutes to make up your mind. This submarine is not

out there about to run out of gas, and it's out there when you want it. We think it allows time for mature decision-making processes to start or not to start a thermonuclear war on a national scale. If you think about the tensions you are going to have if you've got 30 minutes. This is of course what you're going to have to evaluate, and find it is very hard.

Now, the most expensive part of this system, of course, is the submarine. The submarine costs one hundred million dollars a copy. Of course this is about the price of a good big missile base. But it has its own built-in warning system, its own built-in detection system. But you add to any six systems the *pro rata* share of the detection system, and when you look at that you'll find that this FBM combination of a submarine, and a nuclear-powered warhead ballistic missile is an economical one, particularly because the useful life of the submarine is over 15 years and you amortize the cost over that length of time. You put in new missiles from time to time of course, and you continuously have an up-to-date modern system. We don't want to talk economy at the expense of the country, but on the other hand we must have some semblance of common sense as to what kind of hardware we put in the hands of our soldiers and sailors. If we put all of our dough into major war deterrent systems—and believe me you can if you don't look out—we will have an inadequate Army for conventional defense, for conventional war-making capabilities. This means that in a Korean type war we can get our pants pretty well scorched. And those of us who lost loved ones in that Korean War are unimpressed with statements like, "Well that's a small war, we won't bother about those." It's a big war if you lose a father or brother or son. You are going to lose lots of them if they go up against well-armed troops of Soviet-equipped nations. Unless you want your taxes raised, unless you want your country's economic stability to be teetering, let's watch the way we spend our money, let's not go whole hog and put it all in the major war deterrent field. Let's build good aircraft carriers which in themselves are the most powerful single weapon that the world knows for conventional war-making defense. This statement can be supported by any intelligent person. Let's put good guns and up-to-date conventional war-making capabilities in the hands of our soldiers and marines and good practical aircraft in the hand of our Air Force for support operations. These things are necessary. There have been 17 instances since World War II where we have had to use conventional war-making potentials to quiet things down, e.g., Lebanon, Matsu, Korea. And no amount of flybys by fighters or supersonic bombers, either land or sea-based, are going to impress the fellow down there with a club in his hand. You've got to go talk to him in his own language.

Admiral Monroe: It might be useful to explain what the Pacific missile range is and why you see so much in the papers about the customers and so little about the range. I wonder if everybody understands just what the range is composed of. It's composed primarily of my headquarters at Point Mugu. We have an inland range stretching for 400 miles to Dugway, Utah. We have San Nicholas, Island Instrumented, the major firing site Point Arguello, about 40 miles north of Santa Barbara and as an impact area—we have the whole Pacific Ocean. Now where does Vandenberg fit into this operation? Vandenberg is a customer. Vandenberg is a SAC base put there to do a training job and to fire missiles at Russia in case we get into war with Russia. The Navy's a customer, the Army's a customer, so is Vandenberg—it just happens that at this time all the big pads on the Pacific coast are located there because the Air Force started sooner. Early next year the satellite firings will gradually shift down to Arguello. But the ballistic missile firings will always stay in Vandenberg, and that will be the easy way to remember.

Question: Did you say next year the satellite firings will shift down there?

Monroe: They will shift down there, yes, as far south as possible, I didn't mention that.

Question: Admiral Raborn, one question on the Polaris. Has the Navy solved the problem of communicating with submerged fleet ballistic missile submarines?

Raborn: Yes, in World War II. We talked to submerged submarines in World War II. We have improved that capability since then, and as you would expect, we will continue to improve it.

Question: Is it effective within 15 minutes?

Raborn: The details are classified. What's so important about 15 minutes? We are not out there about to run out of gas.

Question: But you do need somebody to give the word?

Raborn: Yes. If you have a good deterrent it's still good, if they have to come up and get a newspaper. That's what constitutes a deterrent, not the ability to get on and holler excitedly over a radio. It's to be able to punch them in the nose when you get ready to. Those people are competent commanders, the weapons are there and they can fire as I say, if they have to go buy a newspaper from the French they can still deliver their weapons and that's what is important, not yakking over a radio. "Quickly, dive for cover, boys." That's about all you'll get out of Washington. These submarines are out there under competent commanders; they are entities in themselves. They can get all kinds of signals. If they don't get a signal every hour on the hour, or every two days, they know the international situation has deteriorated. Those people are there, they're competent commanders, they're Americans and they can be given all the authority necessary to do the job when the right time comes. And we need not impose communications capabilities which are *required* by other systems on this one.

Question: Admiral Raborn, you mentioned the useful life of a submarine is over 15 years. the competitive life of a missile like this one is somewhat shorter. Did you design a second generation fleet ballistic missile? Are you going to have something that fits the same geometry as this one? Or can you make changes in both?

Admiral Raborn: I'm very glad you asked that question. I didn't plant this one, but I couldn't have done a better job if I had. When we proposed this submarine, this weapon system at all, including the missile, we decided we had some five years to see what the state of the art would be then. And we allowed plenty of gross capabilities within the submarine as within the ballistic missile shell. I had plenty of room to expand this way—If you want to get fatter, OK we can get fatter. And we can go this way longer. The answer to your question is we have all the gross potential in the submarine without changing it that we think we'll ever need.

Question: Do I understand that you can fire different sizes and different shaped missiles without modifying the submarine in any way?

Raborn: To the extent that we'll want to, yes.

Question: Are there still nine Polaris type submarines authorized? I have read about six.

Raborn: Yes, those are TAC submarines. I wondered about that too.

(*Continued on page 8*)

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I wondered what happened when I got out of town.

Question: Admiral Raborn, what about the story that the Polaris is a 500 or 750-mile missile?

Raborn: I wish I could find out who started that. I would nominate him for oblivion because there is no essence of truth in it. This has been officially so stated by the number one missile man in the Department of Defense that the range objective for the 1960 missile model is still in excess of 1200 miles (nautical miles; we don't use statute miles anymore). The Department of Defense scientific advisory committee, headed by Dr. Clark Milliken of CAL Tech, recently looked over the Polaris program and expressed itself as being "delighted" with the progress this whole program was making. I don't know how you can get better advice —and I say to people frequently, if you want to know about your health do you go down to the corner bootblack or do you go to your doctor who has plenty of time to look at you? We have a couple of good doctors here who say we are doing all right.

Question: Admiral, how many submarines in your system do you think might be a deterrent?

Raborn: Well, it depends on the Mix. If you want to have a certain proportion of this type and a certain number of that type, obviously you would want a certain number of Polaris submarines. It may be that you will want some surface vessels, a mobile base, a surface missile that is a mobile base is not a good target for ballistic missiles for this reason. It moves around and you can't zero it in very well. It could well be that you would want a number of major war deterrent weapons in the surface ships of our Navy and get these things away from our shores.

Question: These are not only submarine weapons?

Raborn: Oh no, this can be used any place. If you can use it on a ship, boy, you can use it on land or anywhere.

Question: Admiral Monroe, I may be sticking my neck out and being mesmerized by space problems. At Pacific Missile range with IBM 709 and the new data receiving networks that will be used for in-flight course changing for interplanetary vehicles, would this mean that we're going to shoot at Mars?

Monroe: Well, we could but the chances are that we won't. As for the shooting at Mars, we would normally like to shoot from the equator and shoot for the East, because you get your maximum payload for the minimum power plant. In other words, you get about 1500 feet per second free just from the earth's rotation that's greatest at the equator. That is one thing you can't do from this range, you can't shoot over the United States yet, we haven't gotten that far in our quality and reliability in our missiles.

Question: The dickering with the English for the use of Manus—does your office actually have a staff out on that?

Monroe: Well, we haven't done any dickering for Manus and we have no requirements for Manus. I don't know how that got started. We had looked at a lot of islands around the Pacific, and I admit that was one of them that we studied, but we haven't a single requirement nor have we made one move towards acquiring any stations over there.

Question: Does "we" mean the Navy or "we" mean the U. S.?

Monroe: Either—Either or both.

Question: Admiral Clexton, apart from all the glamorous things that are going on now, how about the routine matter of replacing American ships? What does the Navy plan to do to "jazz up" its existing surface fleet?

Clexton: Well, we're trying to increase our appropriations for our ships, because our ships were mostly built during World War II and just after. We are hoping to get some additional funds to put into ships.

Question: At the present rate, how long will it take to replace our fleet?

Clexton: About 20 years at the present rates and by that time, you would be out of ships again, they'd all be old, and I think we've finished the conversions. You just cannot continue to convert ships. Their power plants are too old. That shouldn't alarm anybody; your washing machine goes out of date, so does your automobile, so do ships—it's a natural phenomenon.

Question: Is it difficult to replace the power plant of a ship or impossible?

Clexton: Its really not a good idea; the rest of the hull has also gotten tired and corroded to a certain extent.

Question: Admiral Raborn, projecting ahead to the day when we do have Polaris—carrying atomic subs, do you picture their deployment as being alone or with atomic powered attack submarines like the destroyers around an aircraft carrier.

Raborn: First let me say, don't make that so far in advance; it's just next year. Well, the details are a type of information that would probably give a great deal of aid and comfort to the enemy. What you can be assured of is that we're going to try and employ them in the most effective way possible. It is comforting to know, and this is no military secret, that the waters in which they will normally be employed are neutral waters, friendly waters. Those waters are not available to the Soviets for hunter-killer operations, and Soviet airplanes don't fly over them on a daily basis, and the shores that are watched by these waters are not available to them for shore-detection devices, etc. So our Polaris subs will be operating in as friendly waters as we can get.

Question: How about the matter of resupply of missiles? Have you given any thought to this?

Raborn: Yes, we have, but this is sort of like after the guy's dead, how many times do you want to reload the gun and shoot him again? We hope to have enough combined with the other major war deterrents that if we ever unhappily have to pull the trigger there's not going to be enough left of them to make it necessary to fool around with reloading. As a matter of fact the world will be so radioactive that they'll probably hate to come up. If you get a thermonuclear exchange, the world is going to be in a whale of a lot of trouble, in fact this smog is going to seem pretty good.

Question: Admiral Monroe, you mentioned that the satellite firings will shift to Arguello or the ballistic missiles to Vandenberg, is this going to be true of all ballistic missile firings?

Monroe: Just on the West coast.

Question: If you fire a Polaris, will you fire it from Vandenberg?

Raborn: No, if we fire any Polaris out here, it won't be for some time until the operational subs come out and they possibly fire them for training, they will probably fire them on this range, so that they can get the maximum information out of them. That won't be for some time though. All of the R&D is done on the East coast.

Question: Polaris can still be fired from shipboard not from the shore?

Raborn: I know of no plans for the shore. She's a sea-going missile.

Question: Will the Polaris sub carry any other type of weapons other than Polaris?

Raborn: It will carry weapons which were designed to make it the

(Continued on page 26)

industry "goes to school" at the us army signal supply agency

by

BRIGADIER GENERAL ELMER L. LITTELL, Commanding, USASSA

WE BELIEVE THAT the special project called "Training with the Army Signal Corps," conducted at 225 South 18th Street, Philadelphia, offers a real opportunity to Industry. For here, at the headquarters of the U. S. Army Signal Supply Agency (USASSA), important industrial executives assemble and talk about "going to school" at the Agency, and discuss the value to be derived from a course planned to strengthen the civilian-military team effort.

At the U. S. Army Signal Agency, we do not know precisely how widely known our programs are among people who might find them a matter of personal interest. Recently, one course participant wrote that he and other members of Industry were "so impressed that a great disservice would be done if the work were not publicized." It is for this reason that this article is written.

Industry Sets Example

Actually, our training program is the result of our experience with Industry. For a number of years, as part of a career program, we have sent employees, both civilian and military, into business organizations for "Training with Industry." This was started in 1954 at the direction of the Chief Signal Officer. Personnel have been selected for this training on the basis of experience and the anticipated value of the training, both to the employee and the Government.

Companies participating in the program have ranged, alphabetically, from A to Z—Admiral Corporation to Zenith Radio Corporation; geographically, as measured from our headquarters city of Philadelphia, from International Resistance Company and Philco Corporation here, to the Southern Pacific Company in San Francisco. The many fields of interest to USASSA are indicated by the representation of such diversified activities as Chevrolet, The Hallicrafters Company, International Business Machines, McCormick and Company, Inc., Prudential Insurance Company, etc.

Industry has been happy to afford our representatives the benefit of its experience. Both sides recognize and become familiar with mutual areas for beneficial development, ideas and evaluation. Our people have learned what industry must do to comply with government requirements.

Assignments for training-with-industry have included, among others, supply officers and analysts, laboratory executives, members of the Legal Staff, the Economics Division, Stock Control, Procurement, Quality Assurance and engineers.

We feel that more important than benefits to be derived from a personnel or training angle is the opportunity afforded the representatives of this Agency and the representatives of the Industry involved to communicate and exchange ideas.

USASSA Program

It became apparent to us, and to the organizations participating in "The Training in Industry" program, that even greater benefits would result if we at the Signal Supply Agency instituted a "Training-with-Signal Corps" program for Industry. A reciprocal program where the same companies were invited to send *their* representatives to us, for the purpose of learning how *we* in government operate, made sense. After all, government is "big business" too.

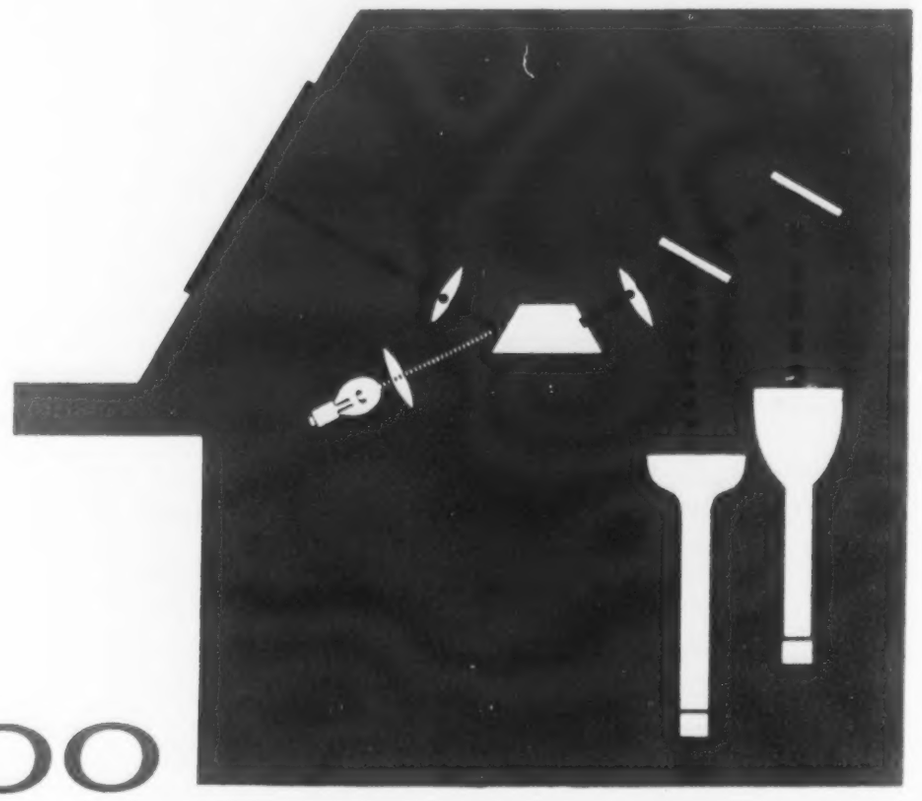
Several firms who had already expressed a desire to learn more about government procedures were invited to send two or three representatives to the Agency to learn, observe and discuss problem areas. This was the beginning of our course. To learn more of our course program, let us consider a typical training course held soon after its inauguration.

Invitations were sent and accepted by Texas Instruments, Incorporated, Federal Telephone and Radio Company, Radio Corporation of America, International Resistance Corporation, Philco Corporation, Hughes Aircraft Company, Eastman Kodak Company. A representative of the Office of the Chief Signal Officer in Washington was on hand to observe and be indoctrinated himself. The head of the Civil Service Commission in the Philadelphia Region and his Assistant came for the purpose of presenting the Civil Service aspect of government.

Our separate activities vied with each other in making our "visitors" welcome and familiarizing them with our agency operations. They were given an explanation of the mission of the Agency, its functions, its organization and the duties and responsibilities involving Procurement, Stock Control, Industrial Preparedness, Quality Assurance, Comptroller Functions, Integrated Data Processing and Administrative Services. A tour of the electronic computer room was arranged so that actual processing of supply papers might be observed. Stock Control's Divisions demonstrated the establishment of requirements, financial inventory management, and processing of requisitions. The Industrial Preparedness Activity indicated the type of actions necessary in a preparedness program. The group learned about the over-all quality control program and its objectives. The Signal Corps Logistics Evaluation Group demonstrated its part in over-all supply evaluation. The responsibility for assisting the small businessman in obtaining production and sub-contracts for equipment was brought out by the Small Business and Industry Liaison Office. An indoctrination into the Military Procurement Cycle was featured. At this point and in line with good public relations and with the idea of getting more personally acquainted, USASSA arranged a dinner for Industry's representatives.

After three days of absorbing and digesting work rations at USASSA headquarters, the group left for a

(*Continued on page* 28)



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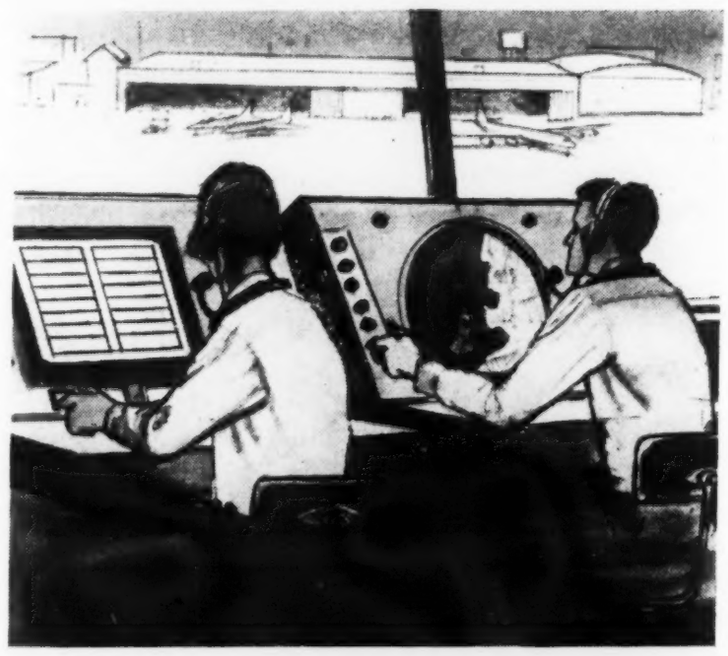

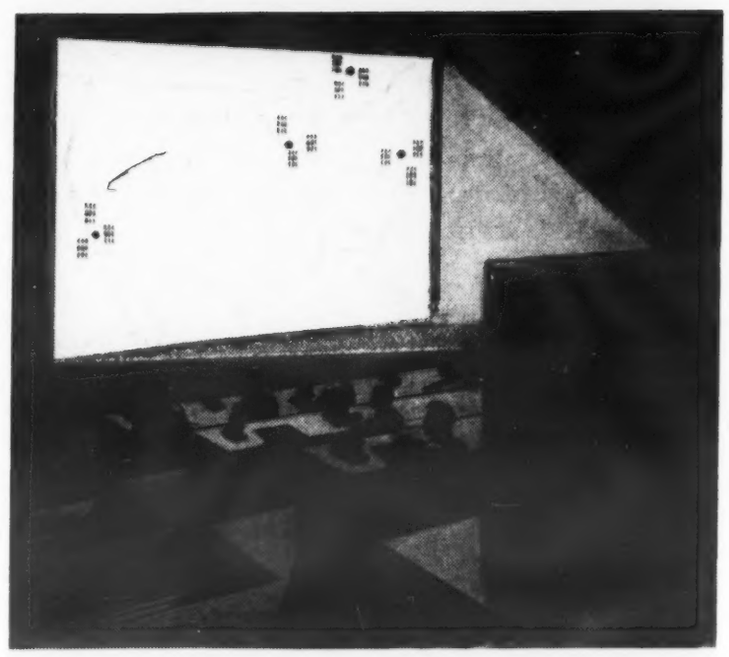

See the S-C 2000 Bright Display demonstrator at the AFCEA Show, June 3-5, Washington, D.C.—Booth 89.

GENERAL DYNAMICS
STROMBERG-CARLSON DIVISION

Interest taken by our Amateur Ham Radio operators in articles appearing in SIGNAL during the past year is appreciated by your Editorial Staff. Among the 170,000 Ham operators there are bound to be differences of opinion and understanding. It is for this reason that we have maintained an open-mind policy to obtain various viewpoints in this most interesting of hobbies. It is our profound desire to present "Ham" articles from time to time to help shoot down misconceptions, to interchange ideas and to provide increased knowledge through interesting reading. The following article is the first of several which will give the military service viewpoint on that group of dedicated individuals we have all come to admire and respect.

THE NAVY and AMATEUR RADIO

by RAdm. Frank Virden, USN
Assistant Chief of Naval Operations
Director, Naval Communications

WE IN THE NAVY LOOK upon the nation's radio amateurs as a group that not only understands military problems from their past and present associations but as a highly dedicated company which will know what to do, how to do it and will have the stern will to do it when the country has need of them, either in or out of uniform. Their influence is greater than their numbers to the extent that they communicate to their non-ham associates the high principles and patriotic alertness that are essential to preserve the strength of this country in these complicated and often difficult times.

To turn from the general to the more specific: from the standpoint of national defense the radio amateurs' enthusiastic pursuit of their hobby produces a high degree of technical competence that many a man fails to get in a naval cruise. We have learned time and again what a valuable reservoir of know-how this creates when the chips are down.

Here is the current Navy policy on amateur radio quoted from OPNAV Instruction 2070.2C:

"It is the policy of the Department of the Navy to support and encourage amateur radio activities and not to engage in any action which would tend to jeopardize the independent status and the prerogatives of the amateur radio operator. Close liaison should be maintained with amateur radio organizations and individual amateur radio operators in planning and practicing for emergency communication service in the event of local emergencies or disaster, etc."

The Navy has been associated with amateur radio for a half century. However, it was not until 1927 that we created the Naval Communication Reserve.

Parenthetically, that was the year I was commissioned in the Navy, so I can claim to be a twin.

From a small beginning, the Naval Communication Reserve was developed by 1936 to 800 officers, 4000 men, 31 government training stations and as a very considerable extra dividend—2500 amateur radio stations. Those radio amateurs who were part of the Naval Communication Reserve during those pre-World War II years do not have to be told what this meant to the nation when the enormous requirements of World War II burst upon us.

After World War II, the Naval Communication Reserve was organized. Well do I remember. I was District Communication Officer of the 8th Naval District at New Orleans at the time. The enthusiasm of the would-be reserves and amateurs saved us a merry chase to set up the training facilities as fast as they were desired.

The new reserve program was called the Naval Reserve Electronics Program. The primary aim of the Naval Reserve Electronics Program is to provide training in the technical and operational aspects of communications and electronics.

To supply this training, the Naval Reserve utilizes Naval Reserve training centers and Naval Reserve electronics facilities in selected cities and towns throughout the United States. Approximately 25,000 communication and electronic rates are authorized training in this program. This program emphasizes operational and practical training. Communication nets have been established in each Naval District. The net con-

(*Continued on page* 30)

For ALNICO MAGNETS—Stock or Special

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U. S. Army Signal Research and Development Laboratory

and

W. R. Donsbach

Electronics Division

Westinghouse Electric Corporation

THE VALIDITY OF this equation was demonstrated on February 25th, before a group of military observers at the Pentagon. Radio Set AN/GRC-53 is a rugged, reliable, v.h.f. radio relay set engineered for use in the highly mobile combat operations that will be encountered by future armies. To demonstrate this capability the equipment was installed in a shelter mounted on a ¾-ton Army truck. Together with the new transistorized carrier telephone equipment, this equipment was the heart of a tactical multi-channel terminal and repeater station, a radio installation capable of providing two 12-voice channel circuits over 400 r.f. channels. The resultant configuration witnessed by the observers was a dramatic display of mobility and versatility. In less than 24 minutes, two Army Signal Corps soldiers put a complete terminal on the air, and established multichannel communications with a remote terminal.

The intent of this article is to describe the technical characteristics and performance of Radio Set AN/GRC-53, performance that places the set high on the list of modern electronic equipment being designed for the Pentomic Army. Particular emphasis has been placed on the electrical design to provide a high degree of selectivity and stability, combined with the latest techniques for minimizing the radiation of spurious signals. Features of this type permit satisfactory operation in an increasingly congested frequency spectrum. Figure 1 gives the minimum frequency separation, in terms of r.f. channels of 250 k.c. spacing, between a transmitter and receiver, with and without a receiver filter, when connected to antennas mounted on separate 50 foot masts. Data is shown for the antennas pointing in various directions with the same antenna polarization.

Separation	Orientation	Without Filter	With Filter
25 feet	Back to back	±10 Channels	±10 Channels
	90 degrees	±20 Channels	±10 Channels
	Front to front	±80 Channels	±30 Channels
50 feet	Back to back	±10 Channels	±10 Channels
	90 degrees	±10 Channels	±10 Channels
	Front to front	±80 Channels	±20 Channels
100 feet	Back to back	± 8 Channels	± 8 Channels
	90 degrees	± 8 Channels	± 8 Channels
	Front to front	±80 Channels	±15 Channels

Figure 1: Minimum Channel Spacing between a Receiver and Transmitter in the same Area.

The AN/GRC-53 is a frequency modulation communication set operating in the frequency range of 50 to 150 m.c. It is composed of a Transmitter Radio T-682( )/GRC, a Receiver Radio R-880( )/GRC, a Filter Assembly, Electrical F-399( )/GRC, an Antenna Group OA-2021( )/GRC and an Accessory Kit. The equipment is capable of providing communications over an obstructed path length of 20 miles minimum. On line-of-sight paths the range extends to more than 150 miles. The power consumption of the entire set is less than 600 watts.

The transmitter is completely contained in a 13¾" x 17" x 15" case. Transmitter frequency control is obtained by a synthesis system, and only the setting of dials is required to select any one of the 400 r.f. channels. Transmitter power output, in excess of 40 watts, is obtained by the simple peaking of the output controls. System monitoring, with appropriate alarms, is an integral part of this equipment. Sub-assembly plug-in construction provides for easy and rapid maintenance.

The receiver is housed in a case identical to the transmitter. The receiver is continuously tunable, and possesses high sensitivity and a noise figure of less than 7 db over the entire band. The same plug-in type construction and system monitoring as employed in the transmitter

(*Continued on page* 15)

THE MAGIC TUNING WAND

REL-10 R-F Power Amplifier

The magic of this tuning wand is in the hand that holds it. It is a practical kind of magic built up over years of experience in the design and development of electronic instruments and systems. It is a capability typical of Rheem electronics engineers... men who have had a hand in conceiving and developing extremely accurate and reliable airborne and ground instruments and systems for the major aircraft and missile programs of the nation.

These same men, working with the most modern facilities available to the industry, are continuing to pioneer new products and electronics concepts:

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Ground Support Equipment	Ground Instrumentation

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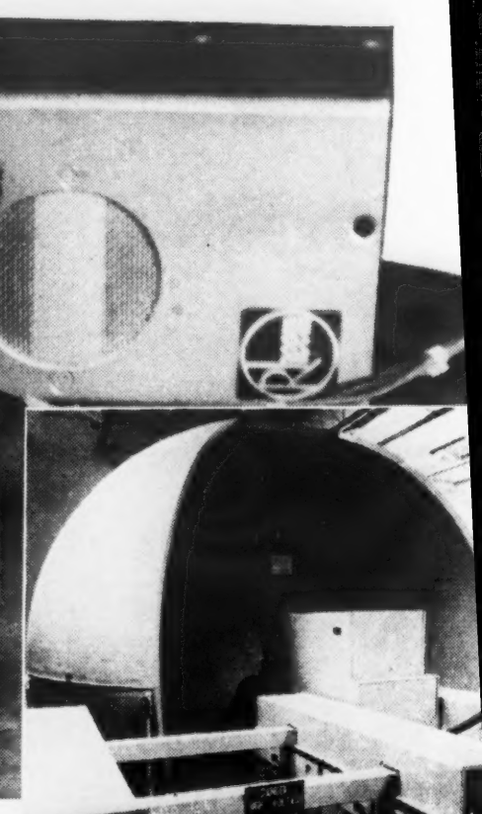
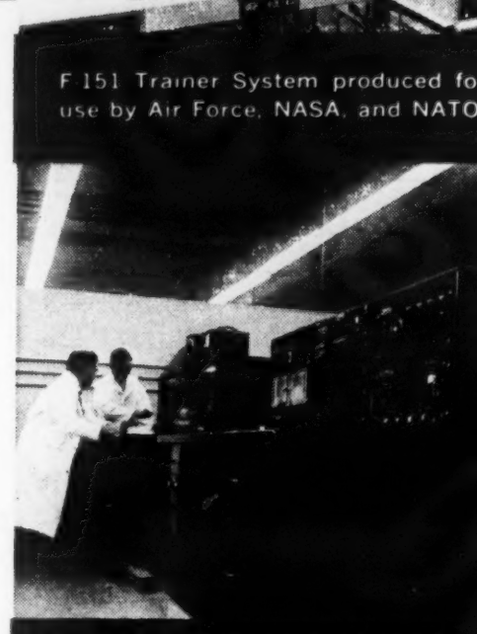
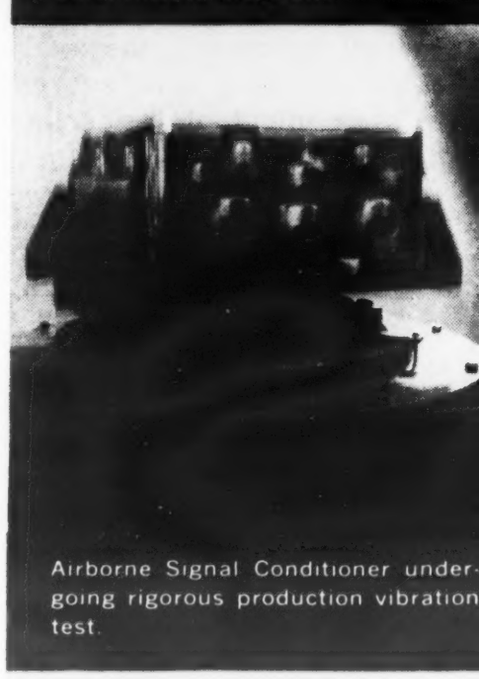
Rheem's miniaturized REL-10 R-F Power Amplifier functioned perfectly during 1,760 mile ride on Thor missile, on 75,000 mile journey into space in U. S. Lunar Probe, and in orbit as part of the Atlas Project Score satellite.



F 151 Trainer System produced fo use by Air Force, NASA, and NATO



Signal Conditioner Ground Checkou System produced for Titan and other missile programs.



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(*Continued from page* 13)

is used in the receiver. The receiver's immunity to the effects of intermodulation and desensitization by interference signals is extremely good. Figure 2 shows the results of a desensitization test with the receiver tuned to a frequency of 149.125 mc. The test procedure is to set a signal to the receiver tuned frequency with some arbitrary output level (—103 dbm in this test). A second signal generator's output frequency is varied above and below 149.125 mc, and the levels necessary to increase the receiver output by 6 db are recorded. The difference between these levels and the —103 dbm tuned signal is the ratio of the undesired to desired signal.

The filter assembly comprises two identical filters, one for receiving, and one for transmitting, housed within a single 8½" x 17" x 15" case. Each is a continuously turnable bandpass filter. No plug-ins or bandswitching are required.

The operating frequencies involved negate the use of lumped constant tunable filters in the filter design. The butterfly capacitor was chosen over the continuously tunable capacity loaded coaxial line, because of the numerous difficulties inherent in the tunable coaxial type. The butterfly approach has been successful in meeting the design requirements.

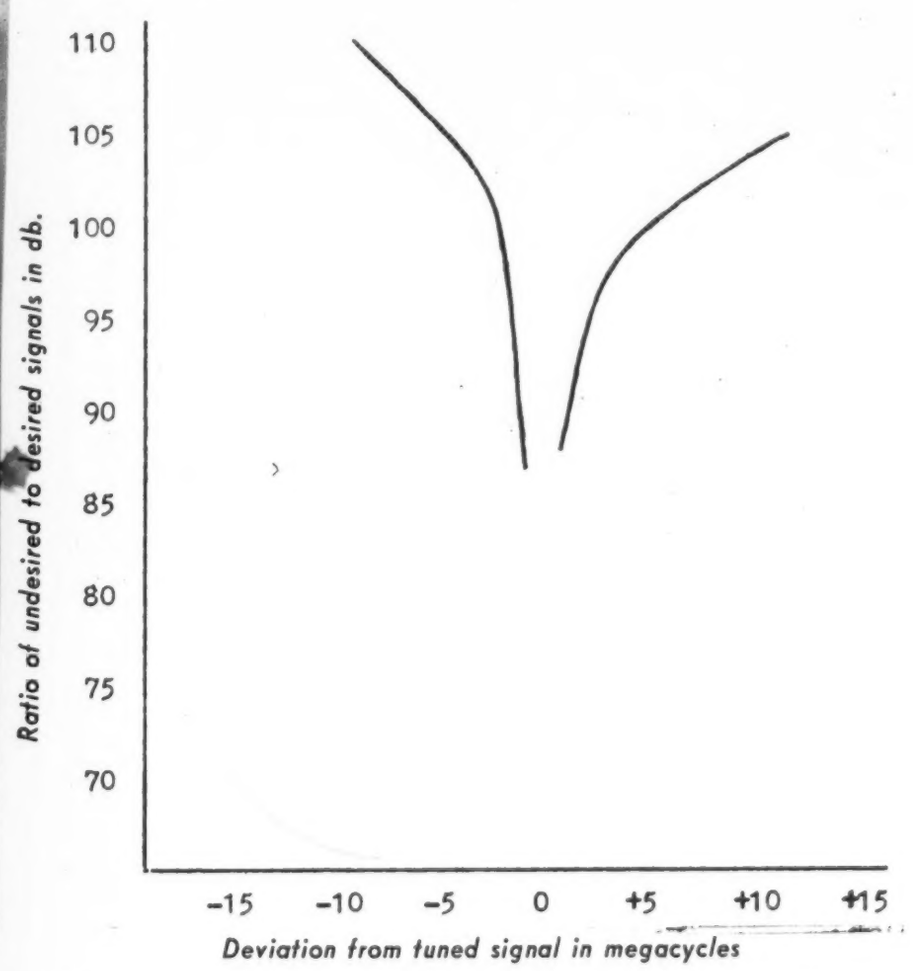

Figure 2: AN/GRC-53 Receiver Desensitization Characteristics at 149 mc.

The frequency coverage of each filter is continuous from 50 to 150 mc, with an insertion loss of less than 1.5 db over the entire range. Each section presents an attenuation of at least 30 db to any signal 15 mc or more away from the tuned frequency of the filter section. Figure 3 shows the sideband attenuation of a single section when tuned to 100 mc.

In order to meet the Army's assignment requirements, the frequency range of 50 to 150 mc has been divided into segments of 50 to 70 mc and 70 to 150 mc, with regard to the antenna groups. It has been stipulated further, that no adjustments be required on the respective antennas to obtain these coverages. For the 70 to 150 mc antenna, this represents a frequency spread of more than

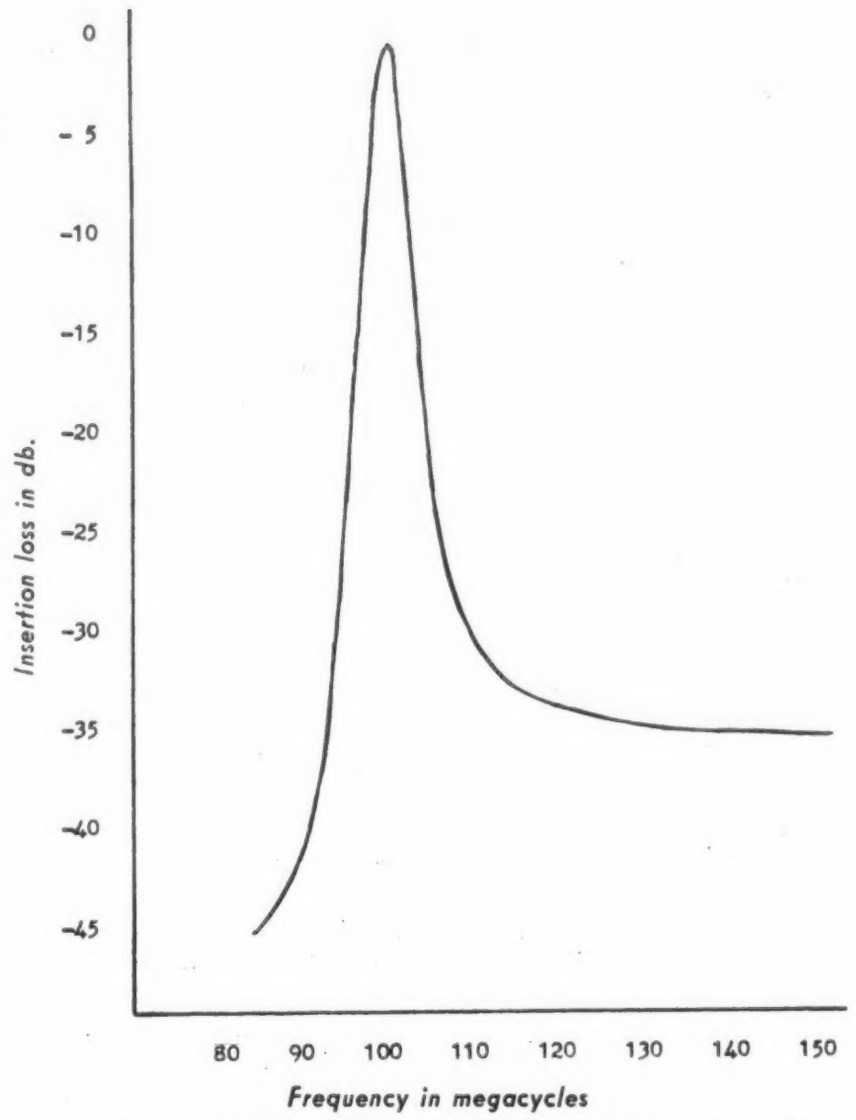

Figure 3: AN/GRC-53 Filter Sideband Attenuation Characteristics at 100 mc.

2 to 1, an imposing design requirement.

By the application of broadbanding techniques, antennas have been designed and fabricated that more than meet the user's requirements. The high band Antenna AT-870( )/GRC, is operable from 70 to 150 mc, with no adjustments. It has a minimum gain of 5 db with respect to a dipole, a major to minor side lobe ratio of at least 12 db, and a maximum voltage standing wave ratio of 1.9 to 1. In the interest of size reduction, the minimum gain requirement of the low band Antenna AT-869( )/GRC has been reduced to 3.5 db.

The manufacture of the AN/GRC-53 equipment cases departs from the usual type of construction in that the cans are fabricated by deep drawing techniques. As a result, the cans are completely seamless. The head part of the case, to which the equipment panel fastens, is fabricated by plaster mold casting. The heads require practically no surface finishing before being inserted in the drawn cans, and a heli-arc welding operation around the periphery of the can completes the construction of the equipment cases.

There is little stress developed in the corners and edges of the case. Metal thickness is uniform throughout, and the resultant case weight is minimum for the degree of protection offered. The case design is ideal for meeting all mechanical and environmental military requirements, and is a direct approach to the Army's least unit cost in production objective.

To keep pace with swiftly changing situations in future tactical operations, a communications system is required that, in addition to being reliable, is both highly responsive and flexible. The AN/GRC-53 has been designed to fill an important role in this system. The AN/GRC-53 has all the facilities required to adjust to rapidly changing tactical conditions with its quick dependable communications.


the SWALLOW
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West Pointers Choose Signal Corps

Forty-three cadets in this year's graduating class at the Military Academy have chosen the Signal Corps as their branch. At graduation these men received their Bachelor of Science degrees, got their commissions as second lieutenants in the Regular Army and pinned the crossed flags of the Signal Corps on their lapels.

After two months' graduation leave, they will report to the Signal School at Fort Monmouth on 11 August to take the Officers Basic Course. Upon completion of that course, each lieutenant will take airborne, ranger or Army aviation training or any combination of these courses, before reporting to his first unit. Each officer is required to take at least one of these courses. Three lieutenants from this class will take all three of these "elective" training courses. Those taking ranger and airborne training will get troop duty as their first duty assignment. Those taking Army aviation training will serve as pilots in an aviation assignment before being assigned to troop duty.

For their first duty assignments, they may choose an overseas theater or the United States. If they choose the United States, they may also select the unit to which they wish to be assigned.

The Signal Corps is proud to have these young men join the "Arm and Service for Command." We wish them long and successful careers, wherever they may serve.

Left to Right

Front Row

1. Ravan, J. E.
2. Colby, N. F.
3. Harris, W. V.
4. Phillips, J. A.
5. Siciliano, A. J.
6. Weber, W. R.
7. Corr, J. C.
8. Lewis, D. A.
9. Farrell, J. H.
10. Schlemmer, R. B.

2d Row

1. McSweeney, A. S.
2. Weisenseel, G. E.
3. Walters, J. P.
4. Chappell, J. E.
5. Mills, J. C.
6. Struble, L. A.
7. Webster, D. M.
8. Palmer, L. J.
9. Moriarty, J. T.

3d Row

1. Freeland, J. T.
2. Haight, B. S.
3. Rushton, P. A.
4. Madden, J. W.
5. Cohan, J. A.
6. Moss, M. F.
7. Ware, R. B.
8. Dorsey, J. A.
9. Weber, R. P.

4th Row

1. Baugh, R. C.
2. Imler, E. F.
3. Howe, R. B.
4. Salvatore, F. M.
5. Bell, A. P.
6. Schmidt, P. B.
7. Burwell, J. M.

Back Row

1. Stocker, W. L. R.
2. Kampf, J.
3. Harkiss, J. F.
4. Kinell, C. E.
5. Ballenger, T. H.
6. Peffenbach, R. R.

Not Shown: Beard, L. L.; Marshall, W. K.

a new day for science

by
DR. JOHN A. YARBROUGH
President
Meredith College
Raleigh, N. C.

A FEW YEARS AGO, I prepared a brief brochure to be used in the promotion of our newly organized science fairs in North Carolina. In appealing for assistance from industry, the newspapers and professional science groups in our state, I recalled some discouraging facts presented in educational statistics of the day. From a conference of educators and scientists held at Harvard University in 1953 came the fact that the percentage of college graduates qualified to teach science in the high schools had decreased by 48% since 1950. This further discouraging statement from the same report: "Already the annual need for new science teachers exceeds 7000 and will soon approach 10,000 while at present a maximum of 5000 *potential* replacements graduate from college."

It is now 1959. It is several Sputniks later. It is now many millions of dollars later—dollars which have been made available for scientific research, for science education and for practical utilization of scientific knowledge. It is now millions of words later, words written and spoken about science, our problems and our achievements therein, and no small amount of talk about Russian achievements in areas where we are or were weak.

It might appear that the American public has really awakened to the importance of sound training in the fundamentals of science in the secondary schools and in the importance of searching for and encouraging science talent. Certainly we are encouraged that emphasis on science and mathematics in our schools, long overdue, is being given by manifold voices and agencies. Yet in this glowing new day for science I would here and now speak words of warning both for ourselves as scientists and for our lay public. It is precisely about this latter group—the lay public—that I want first to speak. It would be most difficult to count the number of times this phrase has fallen from the lips of public speakers or been reproduced on paper: "This is the great age of science" or "This marvelous scientific age in which we are privileged to live." I can recall but a few commencement orators in many years who have not used the phrase in some form. The most charitable comment to be made about such a cliché is that it mistakes science for technology. Our day is one of significant breakthroughs in several areas of science, one of amazing multiplication of machines and gadgets but not one in which science— its principles and simple fundamental methods—are even understood, not to say embraced as guiding principles by the great lay public. "There are millions in the U.S.A. who may mouth science and scientific jargon, yet do not understand the methods of science, much less practice them;" thus says Watson Davis writing in *Science* in September of 1958. Those of us in college teaching must certainly observe that if parents do understand the fundamental principles of science, it certainly fails to rub off on the sons and daughters they send us as college freshmen. I am aware of the difficult of an oldster in understanding the thinking of the youngster, and I would hope that you and I would not be too critical of them. Nevertheless, I must confess to being shocked to the very foundations by the results of the very careful survey of opinion about science and scientists conducted by Doctors Margaret Mead and Rhoda Metraux, published in *Science*, August 2, 1957 issue. This study permits a summary in composite of what teen-agers think about science and its workers. Let me quote a few selected statements from the "negative side of the image of the scientist." "His work is uninteresting, dull, monotonous, tedious, time consuming, and though he works for years, he may see no results or may fail, and he is likely to receive neither adequate recompense nor recognition. He is a brain; he is so involved in his work that he

doesn't know what is going on in the world. He can only talk, eat, breathe, and sleep science. He may force his children to become scientists also. A scientist should not marry. No one wants to be such a scientist or to marry him."

In the face of this blasting condemnation of the scientist and his work from our high school students, I must remind you of the orator at commencement who praises the "scientific age." He voices a wide-spread misconception that science is, after all, the greatest force for change in our world and can do just about anything. Just here is the subtle but critical danger, the emergence of the "Great Superstition," the development in the minds of people of a blind belief and faith in science. "Nor will science really benefit greatly from a disposition to regard it as a form of magic. The attitude that anything is possible was reflected in a recent article which stated facetiously that science has now reached the point where it can make anything out of anything else." (R. C. Hackett) This philosophy, the evidence for which is all about us, may even cause more concern than that of the high school teen-ager. Ironically, the exact methods, by which mankind extricated himself from the morass of superstition and ignorance of an earlier age have become to him the "Great Magic" of all time. What boy does not regard the missile experts as master magicians? Do we not commonly speak of the *magic* of modern medicine and of the *wonder* drugs? And is there not much of real belief in the idea of magic here and not just the use of a metaphoric phrase? I must confess that I sense much of this implied magic of science among my colleagues in the humanities, deans and presidents not excepted.

There is no magic in science but there are *methods*—simple, logical processes by which facts are obtained and used in the solving of problems. Perhaps it will not be inappropriate to re-examine these methods.

The oldest and most used method of science is observation. It requires accurate attention to significant details and an insatiable desire for all the facts available. The oldest scientists were limited to this method in the acquiring of information and yet they were able to recognize many of the laws of nature by its exercise.

Data can be secured by only one other method: experimentation. It differs from the former in that control is exercised over some of the factors involved in the problem. As a result, the investigator is able to get quickly data that might otherwise require years of research or perhaps never be available.

Description seems to follow logically as the next method employed in science. Language may be used, photographs, drawings, measurements, etc. In any case such description results in a permanent record of facts secured and makes available to any and all workers the data of all others. It is obvious that fidelity to the truth is demanded in all descriptions and records of facts gleaned by observation and experimentation. It is at this point that trouble may come. Failure to comprehend the description of facts observed may lead many, even scientists of other fields, to belief in magic. For, if we have inherent respect for the work of such a science and yet cannot follow its lingo, we are prone to paint around it an aura of magic.

Previous to the final method of science, classification must be accomplished. It is here that many of us are led astray in our thinking, and the facts, reliable as they may be, are improperly related and result in artificial classifications. Scientific thinking in any field demands that classification be always on the natural basis and not on the artificial basis.

The final step in the scientific procedure is inference by which we arrive at an answer. Inferences may be insignificant or far reaching, but in their entirely they enable us to state the natural laws, the underlying principles, in any of our sciences. This putting of two and two together requires no superhuman power but it does challenge the best and most painstaking logic of which man is capable. Herein is the magic of science—here in these simple, logical procedures that secure facts and arrive at an interpretation of the facts which solves problems.

The more complicated any scientific discipline becomes, the more specialized its symbols and language, then the more mysterious it becomes to the non-specialist. Witness the symbolism used in higher mathematics. To the extent that mystery enters his mind, he becomes superstitious. To that extent it is hard for him to see the simple methods of science operating in the mysterious field. And at this point, I think it is the responsibility of science and scientists to so interpret their fields of work to other scientists and to the public that the deadly air of mystery, superstition, and blind belief may be dispelled. When and if there is truly a "new day for science," this will mark that day.

Now just what does all this mean for those of us who are scientists in specialized areas and guiding hands in the destinies of more than forty-five Academies of Science? I would like to present five answers. First, I think that we should try to make certain that our young scientists learn thoroughly the basic and simple methods of science. These they should learn primarily by doing, by practice under wise guidance and thorough interpretation. If this is done there will be no serious pruning of laboratory time in favor of lecture demonstration, film showings and clever lectures of the "reading teachers." With the flood of college students predicted for the sixties and seventies, coupled with the inevitable teacher shortage, there will be strong temptations in this direction.

Vicarious experience in science can have meaning and our students must depend on this method to some extent because of limitations of time. But such experience unaccompanied by active doing—laboratory and field work—cannot succeed.

In the area of adult education, the closer our colleges and our academies can come to providing actual laboratory and field experiences for adults, the faster and truer will grow their concepts of what science is really like. This is a tough assignment but museums, botanic gardens, garden clubs, etc., come close to the solution.

Second, our academies must maintain their research paper sessions as a major phase of activity. Even if the "big" research reports are given at the national meeting, there are graduate and undergraduate students who need the stimulus of presenting their work to the smaller, home groups.

(*Continued on next page*)

Scientists, no less than other human beings, are subject to fads and fashions. This is manifest in what they choose to do in the laboratories as well as in the ways they wear their neckties. At one time in biology it was fashionable to count chromosomes. Today, many work with hormones or with radio-active isotopes. One effect of fashion in science is an undue emphasis on one major field of science with the inevitable partial eclipse of one or more other areas.

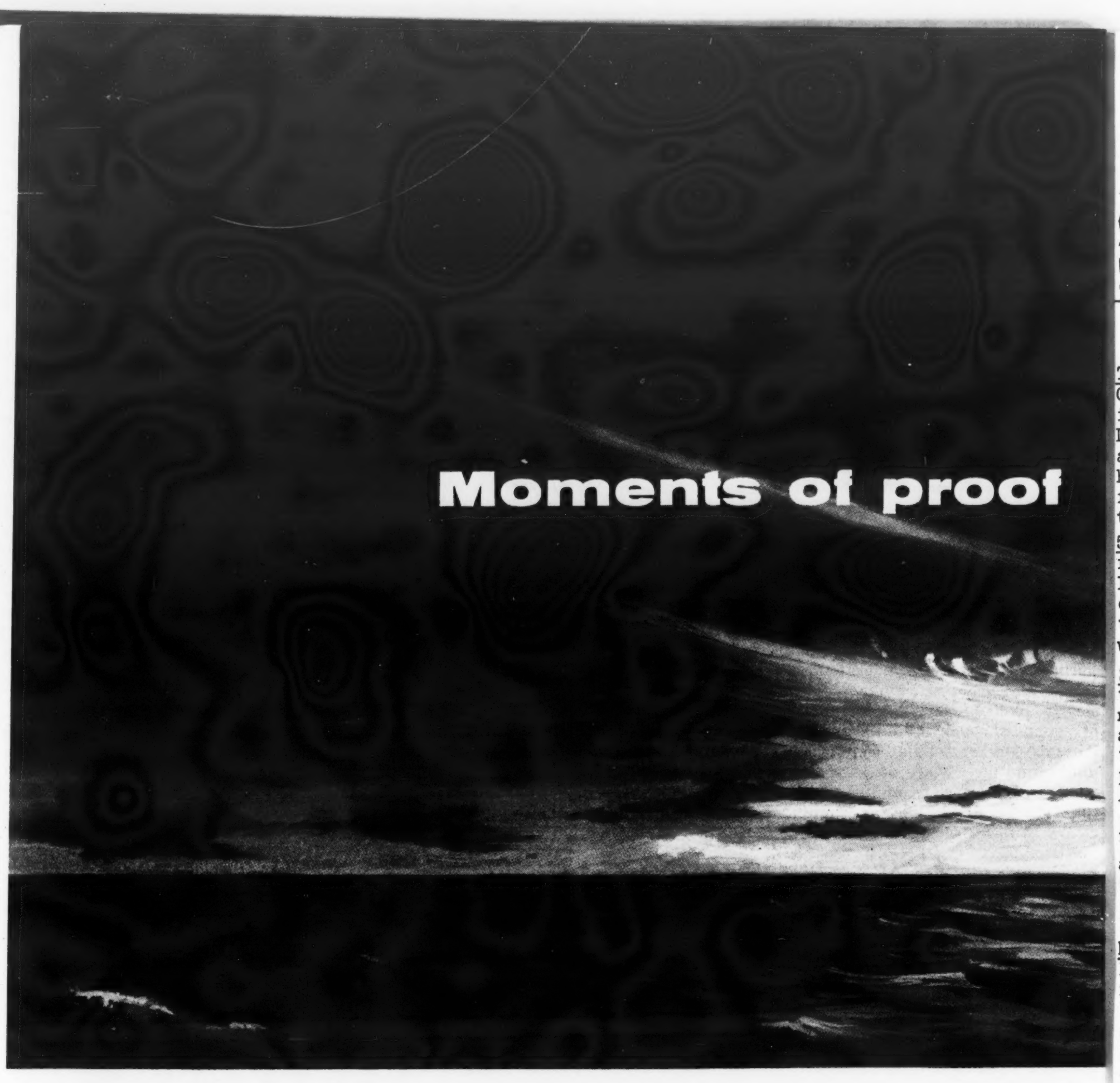
Since scientists are human and thus subject to the influence of fashions, what can an Academy do about it? It can make a valiant effort to keep all its subject matter sections operating in a healthy fashion. It can avoid the tendency to over-emphasize one field in its choice of officers and featured speakers. It can try regularly to give major science areas a place on general academy sessions—even try to keep academy members up to date on significant developments in various fields. It can seek to maintain a climate favorable to the natural development of all true science as interests of its members may dictate. It can seek to bring in a new day for science in which scientists will somehow overcome the splintering effects so evident in our times.

Nor will science come into its own truly, until there is more successful science writing and reporting for the general public. The science reporter is now a respectable member of the journalistic family, and I could wish a more respected comrade of the scientist himself. Sincere science writers can do much to usher in a new day for science and scientists should recognize this principle more clearly. Watson Davis has this to say: "If the great mass of people, through accurate and interesting accounts of the successes and failures of science, can glimpse and understand the essence of science, its trying, testing, and trying again, if they build their own convictions that this is a good, sensible, successful, and useful method, then there is hope that they will apply it more widely to everyday life, to our human relations, to running our businesses, to our governments, to everything that we do." This idea is well put by Robert C. Hackett in a recent address: "In the last analysis, a nation can be great in science only to the extent that the population quite generally shares the scientific spirit and has some inkling of the ways and methods of scientific work.

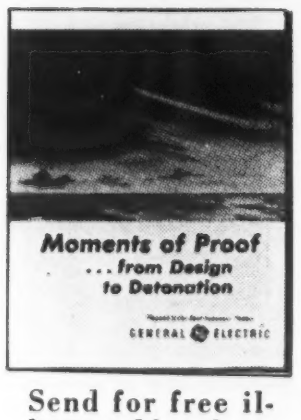
And where do academies fit into this picture? Shall we leave all the public relations to the big dailies and the nationally distributed periodicals? If we do, I fear we will shirk a real responsibility. I think our Academy sessions and our Academy activities should be reflected accurately, attractively, and adequately in the home town papers, even the country weekly. How much have we encouraged a friendly working relation with our local press? How much have we encouraged our reporters, inexpert as they are in science reporting, to discover the significant contributions of our Academy members? We are scientists and citizens and the new day for science will not come until we can somehow discharge our responsibilities in this dual role.

The need for us to discover, train and encourage the young talent that exists within our own children is plain to us all. It has often and truly been said that mankind is always just one generation from ignorance and darkness. Thus it is demanded that we find and train our young leaders even if we merely hold present gains. Any further pushing back of the veil of ignorance must then call for even greater effort.

We must surely realize that our day on the stage fades quickly. Is there to be a new day for science? I think that at best, you and I can only glimpse it. To see the new day, to seize upon it and to use it intelligently—this I would hope is to be the heritage of our children and their children.



..and there are hundreds in an air-launched miss



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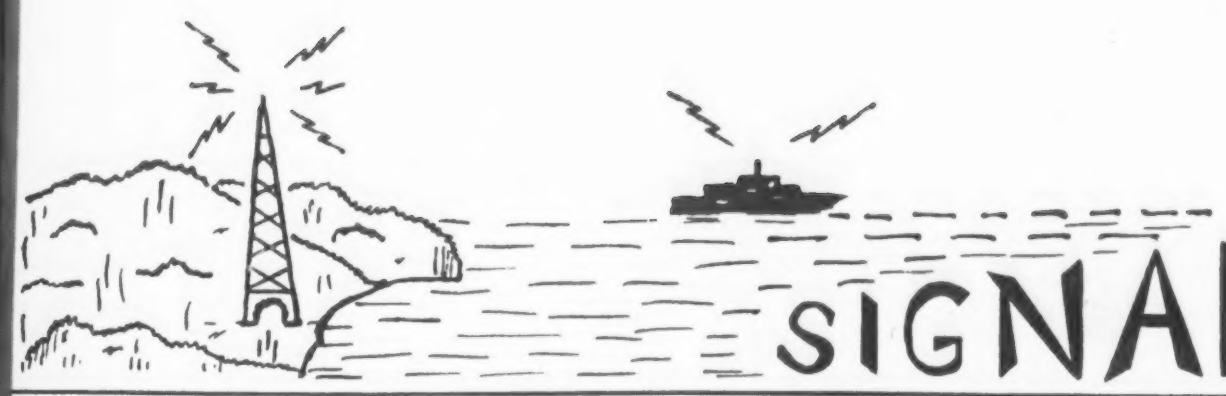

SIGNAL·GRAM

— GENERAL —

THE GOVERNMENT'S SPACE PROJECTS CENTER at Greenbelt, Maryland, will be named the Goddard Space Flight Center in commemoration of Robert H. Goddard, American pioneer in rocket research. Under the over-all guidance of the Director of Space Flight Development at NASA headquarters, the Space Center will perform basic space research and will be responsible for the development of satellites, space probes and vehicles, tracking, communications, and data reduction systems. In addition, the facility will eventually be a command control center for NASA space flight operations.

550 "HAMS" HONORED The Air Force has announced that it has honored 550 amateur radio operators of 50 countries for their cooperation with the Air Force during the International Geophysical Year. The "hams" were the sole source of data for a study of how radio waves travel (particularly those in the very-high-frequency portion of the radio spectrum) which was conducted by the Air Research and Development Command with the American Radio Relay League as the coordinating contractor.

SMALL BUSINESS SPECIALISTS representing the Army, Navy, Air Force and Marines in the states of Delaware, Maryland, New Jersey and Pennsylvania conducted their Annual Joint Meeting on May 22, at the U. S. Naval Base in Philadelphia. Presented and discussed at the meeting were the latest laws and regulations concerning military procurements, concepts at the Department of Defense level, and plans and policies of the Small Business Advisors for the Departments of the Army, Navy and Air Force.

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION has awarded a $33.5 million contract with Convair-Astronautics division of General Dynamics Corp., San Diego, to act as prime contractor for NASA's Vega—a launching vehicle capable of placing a 5,000-pound satellite in an earth orbit. NASA Chief T. Keith Glennan said, "Vega represents the first of our more advanced boosters and its principal job will be lunar and planetary investigation."

HAROLD S. GENEEN has been named to succeed Edmond H. Leavey as President and Chief Executive officer of International Telephone and Telegraph Corp. Mr. Geneen has resigned his former post as Executive Vice President of Raytheon Company to join the ITT system and will take up his new duties next month. ITT said Mr. Leavey will be elected Chairman of the Board and will serve in that capacity until his retirement this summer.

THE FIRST NATIONWIDE HIGH-SPEED FACSIMILE NETWORK, designed and installed by the Western Union Telegraph Co. to provide the U.S. Air Force Strategic Air Command with high altitude weather information at speeds doubling any present facilities, was inaugurated on May 27th at Offutt Air Force Base, Omaha, Neb. and at the National Weather Analysis Center, Suitland, Md. The new system, known as the Strategic Facsimile Network, links 57 AWS weather stations at Air Force bases throughout the U.S. and makes it possible for up-to-the-minute weather maps, 3 times larger than any now being sent by facsimile, to be transmitted immediately to air operation centers of SAC. The Network will be operated by Air Force personnel.

CONTRACTS: ARMY: Philco Corp., production of 700 radio sets, AN/GRC-19, over $3 million; Republic Aviation Corp., detail design and production of advanced combat surveillance drones and ground control systems, $25,000,000; Bendix Radio Div., Bendix Aviation Corp., 360 mobile self-contained communication facility sets and 20 modulators, nearly $3 million. NAVY: Westinghouse Electric Co., Electronics Div., production of long-range air and surface search radar equipment that will be installed for use on newly constructed or modernized destroyers, aircraft carriers, cruisers and other surface ships, $8,000,000; Thompson Ramo Wooldridge, Inc., interference generators, $44,956; Aerojet General Corp., JATO rocket motors and 17 spare igniters, $761,751. AIR FORCE: Douglas Aircraft Co., design of the first air-launched ballistic missile, ALBM; General Electric Co., production of advanced high power, search radars (AN/FPS-7) for air defense, $17,000,000; Lewyt Manufacturing Corp., production of Radom Access Plan Indicators (RAPPI) used in SAGE System, $923,200.

ITT has concluded licensing agreements on its basic radar patents with 2 other firms in the electronics field, Raytheon Company, Waltham, Mass.,and the Radio Division of Bendix Aviation Corp., Baltimore, Md. ITT holds patents on 2 basic radar developments, one called moving target indicator radar and the other plan position indicator radar. The agreement with Raytheon is a cross-license agreement under the patents of both companies in several electronics fields, including some commercial applications. In the Bendix agreement, ITT licensed that company for the plan position indicator radar (PPI) development.

NEW COLLINS SUBSIDIARY Collins Radio Co. has formed a wholly-owned subsidiary called Alpha Corp. Alpha will design, construct and install complex electronic systems such as space vehicle tracking and communication, high capability remote control, test range instrumentation, voice and data transmissions, and integrated ship, airborne and ground communications. Max W. Burrell has been named President of the firm that will maintain offices in Collins' Richardson, Texas, plant.

A MERGER of Metals & Controls Corporation of Attleboro, Mass., into Texas Instruments Incorporated of Dallas, Texas, has been approved. M&C will be made an operating division of Texas Instruments to be known as the Metals & Controls Division. M&C's principal business is the fabrication and sale of clad metal products, the manufacture and sale of thermostatic and electrical controls, and the production and sale of nuclear fuel elements and cores. Texas Instruments is a leading manufacturer of semiconductor devices, such as the transistor, and of electronic and electromechanical systems, apparatus and instruments and is said to be the world's foremost independent contractor of geophysical exploration services to the petroleum industry.

RAYTHEON COMPANY is the new name of the electronics firm formerly known as Raytheon Manufacturing Co., reflecting the broadened activity of the Company which runs the gamut from basic research to field maintenance of intricate military systems. Raytheon means "Ray of the Gods" in Greek.

COOK RESEARCH LABORATORIES, division of Cook Electric Co., Morton Grove, Ill., has established an undersea warfare department to integrate and expand its activities in this area. Cook Research Laboratories has conducted extensive undersea research and development work for the Navy during the past eight years.

MEMBERS OF THE AIRCRAFT INDUSTRIES ASSOCIATION have voted to change the association's name to Aerospace Industries Association. Gen. Orval R. Cook, (USAF Ret.), President of AIA, said, "By our definition, 'aerospace' embraces research, development and production of manned and unmanned vehicles and their supporting equipment for movement above the Earth's surface, whether they move within the layer of atmosphere which surrounds our planet or beyond it."

CURRENT MATERIAL on the nation's space and missile projects is contained in the 1959 edition of U. S. Missile and Aircraft Market published by the Los Angeles Chamber of Commerce. The directory lists complete data on United States missile projects, as well as a cross index of manufacturers and addresses and a roster of military buying offices. Copies may be obtained from the Domestic Trade Dept., Los Angeles Chamber of Commerce, 404 South Bixel Street, Los Angeles, Calif.

A CALL FOR TECHNICAL PAPERS to be presented at the 10th National Conference of the Professional Group on Vehicular Communications of IRE, St. Petersburg, Fla., Dec. 3rd and 4th, has been given. Papers on subjects covering the vehicular systems and equipment designs and other related discussions are invited. Send abstract of 500 words by June 30th to: J. R. Neubauer, Radio Corporation of America, Building 1-4, Camden 2, New Jersey.

CALENDAR OF EVENTS:

JULY 17-19: The 7th U.S. Cavalry Association, (The Garryowens), will hold their annual reunion in conjunction with the 1st Cavalry Division Association at San Francisco, Calif. For further information contact: 7th U.S. Cavalry Association, 515 W. Wisconsin St., Chicago 14, Ill.

JULY 25-31: The 7th National Industrial Photographic Conference is to be held in conjunction with the Professional Photographers of America, Inc. Association's 68th Annual Exposition of Professional Photography at Los Angeles, Calif. The program will include clinics, panels, demonstrations and lectures by outstanding experts.

(Continued on page 33)

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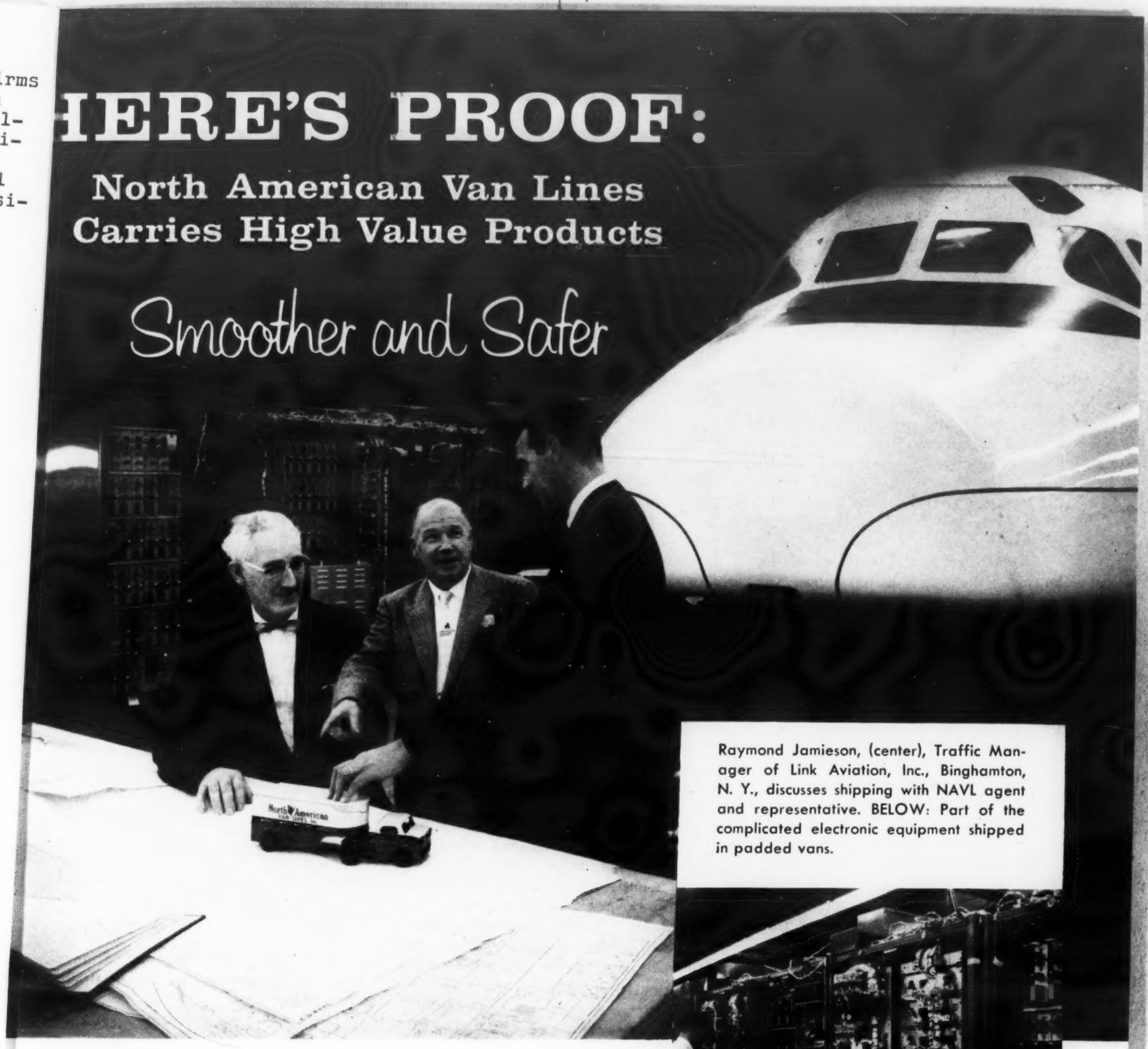
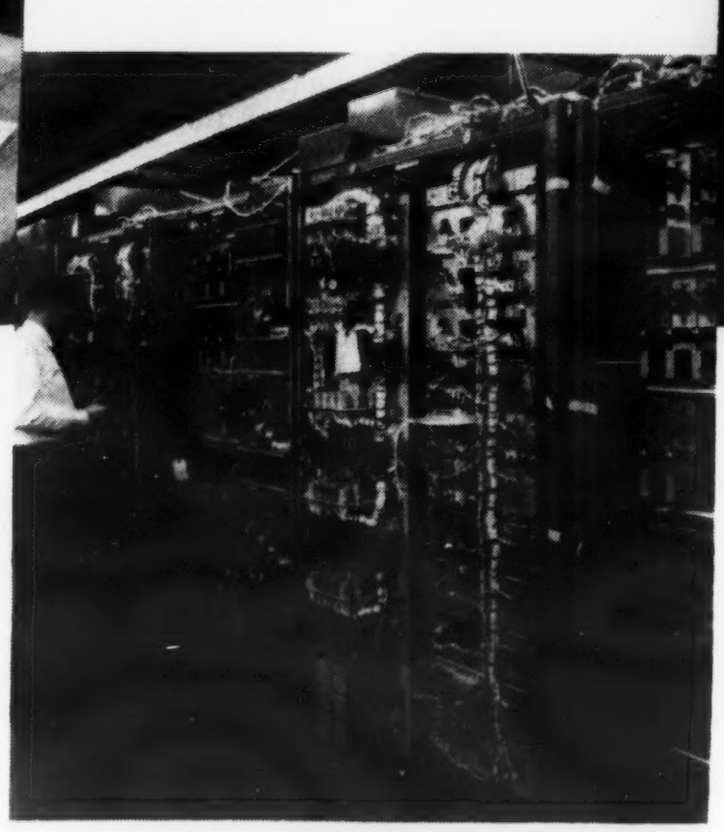


Raymond Jamieson, (center), Traffic Manager of Link Aviation, Inc., Binghamton, N. Y., discusses shipping with NAVL agent and representative. BELOW: Part of the complicated electronic equipment shipped in padded vans.



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Polaris

(*Continued from page 8*)

most effective vessel. Is that sufficiently vague? They will carry many other things that will make them effective.

Question: How deep would the submarine have to lie to be immune to attack?

Raborn: About 10,000 feet, depending on the technical device, of course.

Question: Would the North Sea be deep enough?

Raborn: We hope to roam the Seven Seas, and we don't want to become stereotyped in our geography, because obviously you'll make their job easier if you do. In any event it's not near as transparent as the air. And we're still building things that go thru the air.

Question: Is the problem of detecting a nuclear powered submarine any easier because it is nuclear powered?

Raborn: No.

Question: Are any of the upcoming submarines going to use this super-cavitating screw that's supposed to cut down noise?

Raborn: Soon as we perfect it. It's not perfected yet.

Question: Could that be put on older models?

Raborn: It could be put on them, yes.

Question: Would it be practical from the economical standpoint?

Raborn: I think it would be. You must remember the object of these Polaris submarines is not to run around making a lot of noise. We're trying to make them as quiet as we can. Anything that we can do to quiet these subs down, you can be sure that we're going to do it.

Question: How about enough personnel to be trained properly to sit on the bottom of the sea for days or weeks?

Raborn: We are in process of training our crews now, and we've had very fine response. The human element of this is one of the things we've been giving a great deal of attention to, and I think that you can see readily that we are really pioneering a space travel in these submarines when you cut yourself off from the earth's normal environment in the air for periods of months. We are doing space travel right now. Many of the problems that they will have in space travel, we are now pioneering in and trying to find the best solution, optimum solution. We are even thinking about two-man gyms on these submarines. A little place where you can really work out. We are improving the atmosphere in these submarines; I have started a very intensive scrutiny of everything that goes aboard a sub, the food, etc. For instance, your aerosol spray for your shaving lotion—we found some of those are unacceptable because the gas that pushes it out adds to a small amount of contamination inside the hull. Well, another type of spray will do just as well, so that's the only kind that will be allowed inside the sub. This is the minuteness of detail that we are going into to make the life of the personnel aboard this sub as acceptable as possible. The fact that we are alive and on top of it is the encouraging thing. They are so much bigger than the submarine that you are familiar with, if you are thinking of the old type. This is a very large sub, so there's more room in there too.

Question: What is the length?

Raborn: We are in a continual assessment in the Navy. This is one of our major and primary missions in the Navy. I have good close working relations with the people doing the ASW work and the submarine warfare work. Because we want to put in this baby the lessons we know, and make these more impervious to anti-submarine warfare techniques and tactics. So the answer is yes, very affirmatively, we are in continual assessment, but we haven't solved all the problems by a long shot. We know what they are because we have the submarines, ourselves, that we are afraid they might have some day. We are using our nuclear boats to train anti-submarine teams.

Question: Is there any anti-submarine weapon that we are using on the Polaris type submarine for instance?

Raborn: There will never be a submarine with only one weapon. We need to first find them an enemy submarine, that is one of the difficult problems. Then you have to decide who he is and what he is when you get this knowledge that you've found him. And then you have to use other devices, whether it be an airplane, submarine or missile or a torpedo. We have all those capabilities and they are getting better every day by operating against our own submarines.

Question: Is the Polaris system refined sufficiently so that it can actually hit a target effectively enough to knock it out?

Raborn: Well, that's the object of the game. Of course, it is essential to have good navigation equipment aboard the ship. And I'm very happy to say that the state of the art in the ship's inertial navigation system has progressed to a vast and remarkably high degree. North American is doing some of the work for us. Sperry is doing some work for us on the East coast. All inertial guidance systems utilize the same technical principle, and there is no inertial system that has any other technical principle to do the work, because there is no black magic available to some people which is not available to others. The key to all of this, of course, is to get good gyros that do not precess—of course, they always will precess but which don't precess in short lengths of time. Of course, this is a classified matter, but I am very glad to say that we have a very useable inertial navigational system for our ships today. We will correct them from time to time, but this is what you do anyway.

Question: Will the system be ready in time?

Raborn: Yes, we have demonstrated already—we are a year and a half ahead of when we had to have it. We would do the required navigational positioning in order to start a ballistic missile off in a proper path. Here again we don't penalize ourselves by having only one way to do it. The idea behind all of these systems is to be as flexible and as versatile as possible in order to make it as tough on the enemy as possible. We have several ways to do this job and I'm very happy to say that our navigational development is ahead of schedule.

Question: Do you place primary reliance on the inertial navigational systems?

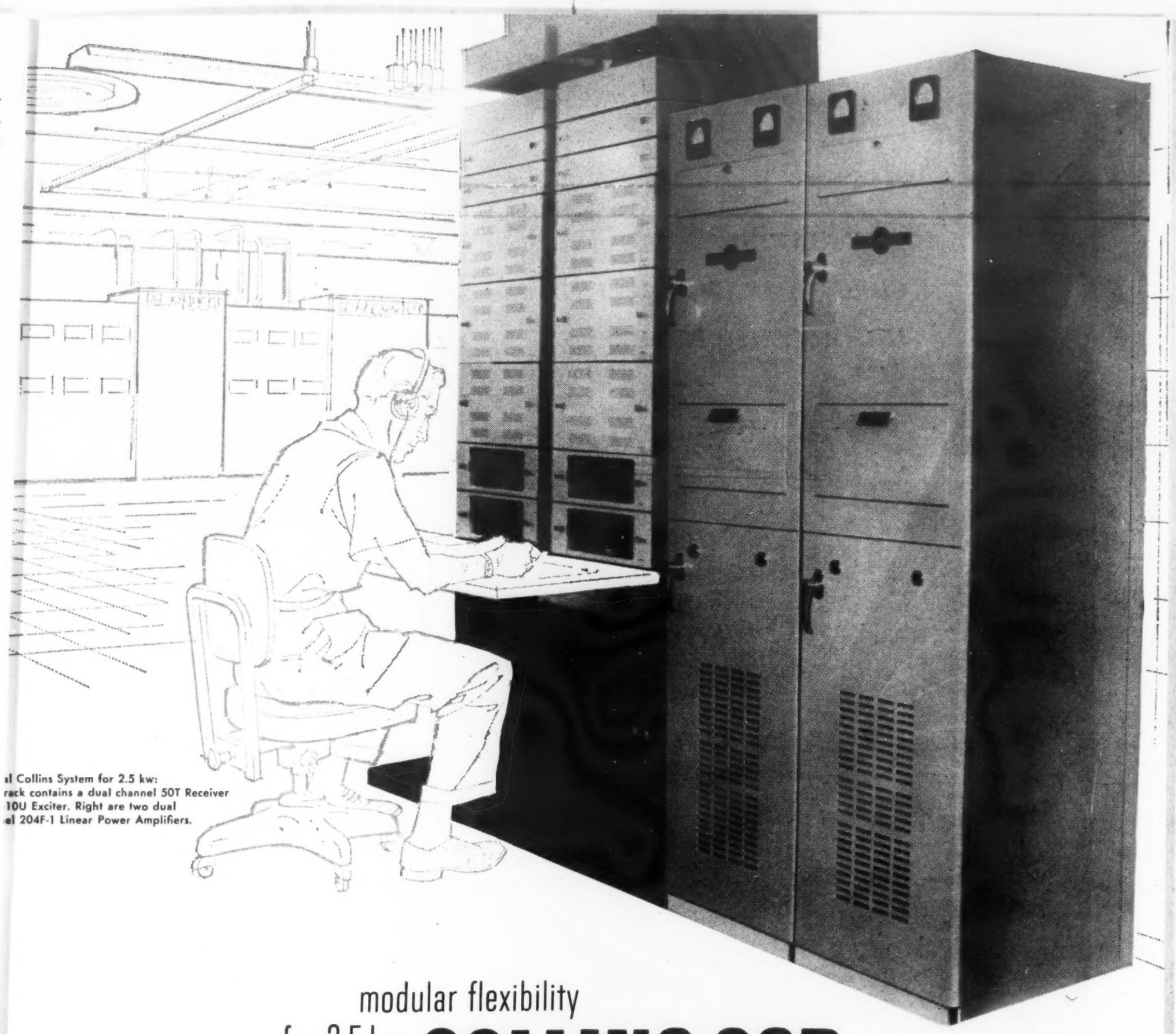
Raborn: I place primary reliance on it as a keeper of the facts. In other words it is the instrument that is the repository of all the information on all navigation systems. It goes in there and keeps it and makes it available to us when we want it for putting it into the missile.

Question: Do you have other means for getting fixes that are good and at rapid enough intervals?

Raborn: That is what I was just saying, that the versatility of correcting the ship's inertial navigational system, the flexibility—we are ahead of our development schedule on it. Actually there is no problem; the problem is pretty well licked.

Question: In the submarines that are available today could we put a Polaris on target?

Raborn: We're shooting for 60, remember. 1960?



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rack contains a dual channel 50T Receiver
10U Exciter. Right are two dual
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modular flexibility for 2.5 kw communication stations

COLLINS SSB

The building block nature of the linear power amplifiers, exciters and receivers in Collins' single sideband line enables tailoring a system to the specific functions required or updating that system to expand these functions.

In the typical Collins system shown, the basic exciter is the 310U. This exciter uses plug-in modules as required to provide from 1 to 10 crystal-controlled channels in the 2 to 30 mc range. Exceptional circuit simplicity and reliability is achieved by a single conversion frequency generation scheme, with a crystal filter rejecting spurious products ahead of the RF amplifiers.

Although suitable for linear power amplifiers with higher output power, the 310U is employed in this illustration with the 2.5 kw PEP 204F-1 Linear Power Amplifier. This power amplifier has two sets of tuned circuits for rapid selection of either of two channels. Each channel is manually pretuned to any frequency in the 2 to 30 mc range.

Another 2.5 kw PEP linear power amplifier that might be employed is the 204H-1, which automatically senses the exciter signal frequency and tunes itself to that frequency.

Closely related to the 310U is the 50T Receiver. It has up to 10 channels in the 2 to 30 mc range, with single conversion and modular flexibility. A crystal filter ahead of the RF stages provides exceptional RF selectivity.

Other equipment in the complete Collins SSB line can provide from 100 watts to 45 kilowatts output with manual or automatic servo tuning. For more details, write for literature or contact a Collins representative.

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Industry Goes to School

(*Continued from page 9*)

tour of the Tobyhanna Signal Depot in the foothills of the Pocono Mts., Pennsylvania. Here, as a final phase of the program, the principal avenues of interest explored related to the storage and maintenance divisions.

Course Objective

Every course has an objective and ours is a balanced program, wherein those in attendance not only see and hear about the actual Army Signal Corps operations but also have an opportunity to discuss these operations with a number of our key personnel.

Everyone connected with the program appreciates fully the opportunity to present to high-level executives of Industry a realistic picture of what our Signal Agency is doing. Our aim is to clear up any operational or procedural doubt. Our reward to date has been the profound interest and attention displayed by the participants.

At the conclusion of the program, certificates are presented in recognition of individual active participation. It is a matter of pride to USASSA to see these certificates on display in executive offices we visit at a later date.

It is our purpose to continue this program, possibly in a revised form. One suggestion calls for shorter seminars, possibly of one week's duration at the top executive level where Army Signal Corps Commanders and Industry executives might visit with each other and review major operations. Another idea being studied is that of inviting industry to submit questions as to how we might be of greater assistance in solving some of their problems, with the questions taken up at a two-or-three-day seminar. This procedure would give the Signal Agency an opportunity to learn what problem areas require further emphasis and, at the same time, screen questions which, for purposes of security, cannot be answered at a public seminar.

From the many favorable comments received to date, the consensus is that the representatives of Industry agree that the program just outlined results in better government-industry relations for everyone—including the taxpayer.

USASSA is convinced that both "Training-with-Industry" and "Training-with-Army" not only fall well within its mission but should have been initiated years ago.

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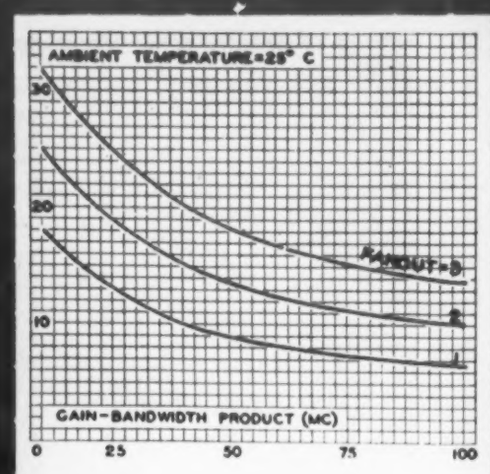
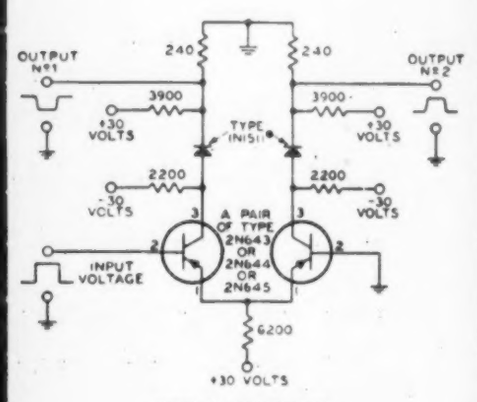


Curves illustrate typical delay time per stage vs. gain-bandwidth product and fanout for the switching circuit shown below.



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Minimum collector** breakdown volts	30	30	30
Minimum DC current transfer ratio*	20	20	20
Maximum collector capacitance μμf	5	5	5

*Collector Volts = -7, collector ma = -5
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(*Continued from page* 11)

sists of over 500 well equipped Navy radio stations.

To further supplement training, the Naval Reserve Program encourages trainees to participate in amateur radio activities. As a consequence, in addition to having over 500 Navy-owned stations licensed for amateur operations, we have more than 1600 individual Naval Reserve amateurs with personally owned equipment that is readily available for expansion of our network. This is a tremendous asset to us who find that our enthusiasm for pushing ahead in regular military communications is confronted with practical budget limitations.

Many of our training centers conduct code and technical training classes at times other than during regular drill periods. Persons interested in communications, regardless of whether they are associated with the unit or not, are encouraged to participate and are welcome to take advantage of this training. We would like to have you, the radio amateur, pass this word around.

This is a short article, or I could go into a great deal more detail about the Navy programs: for instance, we now have active duty amateurs aboard ships on remote duty. We have a large number of active duty Marines operating from widespread Marine Corps posts. These features of our program are similar in many respects to the MARS system.

From the spark days to satellites, the amateurs have kept pace with the progress of communication and contributed greatly to this rapid advancement. They have even kept ahead of it and led the way quite often to new developments. Those of you who are interested in the technical advancements of communications are entering an era of monumental challenge, a challenge far greater than that which confronted those that are now known as old timers. The inspiration and opportunities for new ideas are greater than ever before and the expanding ranks of the radio amateurs, that now number of 150,000 members in the United States, are keeping pace with the new look.

Going forward is the business of the civilian and the military experts in the highly complicated fields of communications and electronics. For them, the best is never quite good enough.

To me, it is gratifying to know that we have so many experienced people and enthusiastic youngsters still probing for better and more efficient ways of improving our way of life and providing greater capabilities for our military equipment.

In conclusion, the Navy and amateur radio have had a long and rewarding partnership. You may all rest assured that the Navy always will strongly support your efforts for continued progress.

ARMY SATELLITES — TEAMWORK MEANS PROGRESS

(an historical account) by PIO, U.S. ARMY ORDNANCE MISSILE COMMAND

In slightly more than two months, scientists and engineers of the Army Ballistic Missile Agency in Huntsville, Alabama, and the State University of Iowa designed, built, assembled and thoroughly tested an earth satellite that was destined to play a role of utmost significance in pioneering efforts to explore space.

The satellite instrumentation was the type flown in the Army's *Explorers IV* and *V*, the most advanced radiation detection apparatus known.

The mission of the latest *Explorers* was outlined by the earlier Army satellites: to measure more accurately and attempt to define the unexpected concentration of high radiation found at extreme altitudes.

The earlier satellites in the Army *Explorer* series, numbers *I* and *III*, encountered radiation many hundreds of times higher than the expected level—so high that the single Geiger counter installed aboard each of the vehicles was blocked and rendered inoperable in the distant reaches of its orbit.

Scientists associated with the International Geophysical Year research program saw this as an extraordinary discovery in the realm of science, which might delay and make more difficult man's entry into outer space.

Even before results of the radiation experiments in *Explorers I* and *III* were announced officially on May 1, 1958, IGY leaders began serious deliberations of possible means to substantiate the radiation data and to continue the historic investigation.

By mid-May the Advanced Research Projects Agency of the Defense Department had directed the Army Ballistic Missile Agency to prepare for two more satellite launchings. These two satellites, identical in size and similar in composition, would be twins in space—launched in relatively close sequence and devoted exclusively to taking more accurate readings on the level of radiation and determining as closely as possible its nature and source.

On May 10, 1958, just 77 days before the launching of *Explorer IV* from Cape Canaveral, the satellite's instrumentation existed only in the form of rough sketches at the State University of Iowa, where the main load of designing and fabricating the intricate experiment was to be assumed.

The Iowa group, under the leadership of Dr. James A. Van Allen, head of the Physics Department and a prominent IGY scientist, was responsible for the cosmic ray experiments in the first satellites. Van Allen has a broad background in upper atmospheric investigation. He has been launching sounding rockets with radiation equipment aboard for more than a decade, and is known as a world pioneer in this field.

Assisting Van Allen were George H. Ludwig, who had designed the cosmic radiation equipment in the earlier *Explorers*, and Carl E. McIlwain, who had produced detectors used in rocket firings at Ft. Churchill, Canada, to measure somewhat similar radiation.

Work had begun in earnest by the middle of May. The Iowa physicists had to redesign the earlier *Explorer* Geiger tube circuits to allow measurement of the high intensities, and design new scintillation detector circuits to measure the energy distribution of the particles.

The big problem at Iowa was in the designing and building of the four-detector radiation package. The communications system was to be composed largely of proven components. One transmitter and the telemetry system to be provided by the Jet Propulsion Laboratory had an imposing record of success in *Explorers I* and *III*. The other transmitter had a long history of testing at the Naval Research Laboratory where it was to be produced.

On June 8 the first prototype was delivered to the Army Ballistic Missile Agency. The Missile Agency had the responsibility of providing the four-stage *Jupiter C* launching rocket, and modifying, testing and assembling the various components of the satellite.

The work at the Missile Agency, located at Redstone Arsenal, was under the technical direction of Dr. Wernher von Braun, Director of ABMA Development Operations. Immediately in charge of the project of designing, assembling and testing of the new satellite payload were Josef Boehm, Project Engineer, and Heinz Kampmeier, Coordinator.

Boehm has the distinction of being the designer of the first instrumented earth satellite in the U. S. and perhaps the world. He conceived the basic layout of the cylindrical *Explorer* satellite design five years ago for the short-lived Army-Navy "Project Orbiter."

Scientists and engineers in the Missile Agency's Guidance and Control Laboratory began the testing, assembling and retesting of the prototype satellite payload.

Suggestions on improving the design and increasing the reliability were relayed to the Iowa group. Dr. Walter Haeussermann, Director of the ABMA Guidance and Control Lab, dispatched two engineers to the Iowa campus to assist with the design, fabrication and testing there.

Shortly afterward the actual flight units started arriving at the Missile Agency, and all had arrived by July 1. There were four flight units, in addition to the prototype. All had to undergo the same rigorous testing at ABMA. While only two were to be launched, two others were desired as standby units for use in case malfunctions occurred late in the preparations.

Although the two satellites were placed in orbit nearly a month apart, they were fabricated and tested together and were ready for launching in late July.

Based on early data from *Explorer IV*, *Explorer V* was later modified to provide still more information on high energy radiation. Several changes were made, including a three-fold increase in the amount of lead absorber shielding

one Geiger-Mueller tube. This was designed to produce more useful data on the distribution of high energy particles. A slight increase in payload weight resulted.

All of the 10 laboratories in Dr. von Braun's division of ABMA were involved in the successful launching of the rockets which carried the *Explorer* satellites into their orbits. It was, however, the Guidance and Control Lab and the Structures and Mechanics Lab which prepared and assured proper operation of the instrumented satellites themselves.

When the flight units left the Huntsville installation everything that could possibly be done to assure correct functioning had been taken care of. Because of the crucial time schedule, Guidance and Control Lab personnel worked on a 24-hour basis for several weeks—and many individuals worked as long as 30 to 40 hours consecutively, Boehm relates.

This, in general, is the process each of the flight units went through in its preparations for a journey into space.

First, each of the units had to be assembled—the bringing together of components from Iowa, JPL, Naval Research Laboratory, ABMA, and the Army Signal Corps.

Then came a series of nearly a dozen exhaustive environmental tests which were designed to simulate the conditions to be met during the ascending part of the trajectory and during orbiting.

A preliminary heat check was conducted in cooperation with the Agency's satellite thermodynamics expert, Gerhard Heller of the Research Projects Laboratory. This test was to determine if the internal temperature stayed within the desired temperature range, 0 to 60 degrees Centigrade.

A vibration test followed in which the payload was mounted on a shake table to see if the instrumentation would resist the sudden force experienced when the upper solid stages of the *Jupiter C* were ignited, to a final velocity of 18,000 miles per hour.

Next was a spin test designed to discover if the spinning of the *Jupiter C* cluster had a detrimental effect on the delicate instruments.

Since the satellite was to operate in a near-vacuum, this condition was simulated as nearly as possible in the laboratory. Low pressure was exerted on the payload without harmful results.

Then followed a centrifuge test which simulated simultaneously the spinning and the thrust of the rocket's cluster.

The satellite payload was placed in a linear accelerator to test the possible reaction to the initial shock resulting from the ignition of the high-speed upper stages. When these stages are ignited, there is an acute shock for a few milliseconds. This test was performed in a unique pogo-stick type device which subjects the satellite to rapid vertical movements in a cylinder. The device was developed by Boehm's unit, and is the only one in the United States.

Exact temperature calibration tests came next. The satellite was placed in an ABMA-designed device where it was alternately subjected to high and low temperatures, simulating conditions to be encountered as the vehicle passed in its orbit from the earth's shadow into sunlight.

A balancing test was performed in order to check the aero-dynamical behavior of the satellite in flight.

The satellite payload was then taken to a nearby outdoor area for two exanimations. It was suspended from a tower in a field strength test of its antennae. This was necessary to determine if the transmitters were working properly with the antennae.

Finally, it was mounted on the upper-stage cluster of the *Jupiter C* for functional testing. Everything was put in operation. The cluster was rotated, and the radio equipment beamed signals to a nearby tape recorder.

Everything was in readiness. The fabrication, assembly and the seemingly unending test had ended.

The first reports issued by IGY scientists on the satellites indicate that the dedicated work of the Iowa-Army group has paid off. The space *Explorers* have functioned efficiently and scientific data of monumental importance is being received and analyzed daily.

— ITEMS OF INTEREST —

FIGHTER-BOMBER "LOBS" A-BOMB Flying supersonically at tree-top height to evade radar detection, the Air Force's newest fighter-bomber has demonstrated how it could "lob" an atomic bomb on an enemy target and safely escape the blast. Publicly unveiling the punch that is this year being added to the Tactical Air Command, the Republic F-105 Thunderchief—a fighter-bomber capable of speeds over 1300 mph—tossed a 750-pound bomb in an exhibition of low altitude bombing maneuvers. As the plane approached the target, it executed a 180-degree vertical turn as a special computing device linked into the jet's fire-control system ejected the bomb so that it was "lobbed" onto the target as the F-105 streaked to safety in the direction from which it had come.

PAGE BECOMES SUBSIDIARY Page Communications Engineers, Inc., Washington, recently became a wholly-owned subsidiary of the Northrop Corporation. Esterly C. Page, President and founder of the new subsidiary firm, made the announcement following the issuance of a permit by the California Commissioner of Corporations. Under the agreement, Northrop exchanged 95,000 shares of the corporation's stock for 100 percent of the Page organization's stock. The firm is presently engaged in the overall instrumentation study for the Navy's vast Pacific missile range.

SKIN-DIVERS AND "ATOMIC WASTE" Skin-divers with color cameras will watch at the sea bottom this summer as simulated packages of "radioactive waste" are dumped into 50 feet of water off the New England coast. The job will be done under an agreement with the Atomic Energy Commission by oceanographers of the Coast and Geodetic Survey, U. S. Department of Commerce. Instead of real atomic waste materials, the packages will contain a dye that will be readily recognized in the water if a package leaks. The Atomic Energy Commission wants to know whether such containers remain intact, break open, gradually disintegrate or are buried in the bottom. The study is part of a larger project planned to find out what happens to radioactive waste dropped into the sea, so that the best disposal, areas and methods can be determined.

"NIGHT EYES" New "night eyes"developed for Army tanks helped the Navy's atomic submarine Skate probe a path through the ice in its journey to the North Pole, the Army announced recently. The super-sensitive viewing device, similar to a television camera and mounted in a shock-proof container on the vessel, gave the crew inside the submerged submarine a view of the ice above. The viewer was developed primarily for mounting in a tank to permit fire direction against targets at night. The new equipment has been described as one of the greatest advances in its field.

HALF MILLION FOR GRANTS Support of scientific publications and information services by the National Science Foundation as part of a stepped-up program under its office of Science Information Service totaled more than half a million dollars in 12 grants during the first quarter of 1959. The intensified program is designed to assist scientific publications faced with difficult problems in making available to the scientific community mounting qualities of newly-produced research results. Support of this type by the Foundation during 1958 totaled $1,032,994 in 51 grants. Compared with the 1959 first quarter figure of $527,803, eight grants totaling $109,300 were made during the same quarter of 1958.

INTERNAL INFORMATION PROGRAM The Secretaries of the Army, the Navy and the Air Force have been requested to conduct an internal information program, to include the reserves, so that all commands and members of the Armed Forces may be prepared to discharge promptly and effectively their responsibilities with respect to areas in the civilian domain in the event of enemy attack or other emergency situation. To assist in publicizing this role of the Armed Forces, a training film entitled "Military Assistance in Civil Defense" (Cummings City) is available for civilian audiences and may be obtained through the film libraries of the services. This film portrays the current Department of Defense effort to promote throughout the Armed Forces a better understanding of their role in assisting civilian communities in times of need.

FUTURE POWER SOURCE A method of lighting whole cities with small, efficient generators which will operate by shooting electrons and ions through a magnetic field was described recently by Joseph L. Neuringer, Republic Aviation Corporation scientist. Dr. Neuringer said that electricity can be generated by forcing an electrically conducting plasma (a gas broken into electrons and ions) through a strong magnetic field. According to reports, efficiencies as high as any known power generation method can be obtained.

— NEW PRODUCTS —

A ROCKET-PROPELLED CAPSULE that can shoot a pilot to safety from a doomed plane within two seconds has been designed by Republic Aviation Corp. The capsule functions as a seat during normal flight; in an emergency it automatically closes in around the pilot to form a protective cocoon and is then shot out of the plane along a short set of rails. Designed chiefly for the supersonic Mach 2 and Mach 3 aircraft, the device operates with split-second timing and assures a soft landing for the pilot by the use of a parachute.

HALOID XEROX INC. has developed a machine which makes inexpensive finished pictures in seconds from photographic negatives without the use of chemicals or sensitized paper. The machine operates on the principles of xerography—an inexpensive, fast, electrostatic process which reproduces anything printed, typed, written, or drawn, onto almost any kind of surface. Designed primarily for use in high-speed, high-volume printing from aerial film for mapping and reconnaissance purposes, the machine was developed for the U. S. Air Force. At the present time, the machine is is not available commercially.

UNIVAC SOLID-STATE DOCUMENT PRINTER, the first electronic printing unit to compute, edit, punch, print on both sides and segregate any standard tabulating-sized documents in a single operation is a new development of the Remington Rand Division of Sperry Rand. The printer is designed to eliminate manual and peripheral machine operations; the tape can be fed directly into the printer and all final printing steps are handled automatically at high speed. Economy in cost, maintenance, floor space and power requirements are achieved by use of the solid-state design.

A NEW INFRARED DETECTOR that combines sensitivity, speed of response and broad spectral coverage has recently been developed. Introduced by Perkins-Elmer Corp., and developed at Naval Research Labs., the P-E 536-1 "ZIP" Detector should aid significant advances in military, research and industrial applications of infrared instrumentation, such as reconnaissance and air warning, navigation and space exploration. The first such detector to afford full coverage of the 8 to 14 micron region of the IR spectrum, the device is sensitive to IR radiation from bodies at room temperature and cooler; its full range of spectral response is from 2 to 40 microns and peak sensitivity occurs at 37 microns. Its time constant is less than .01 microsecond.

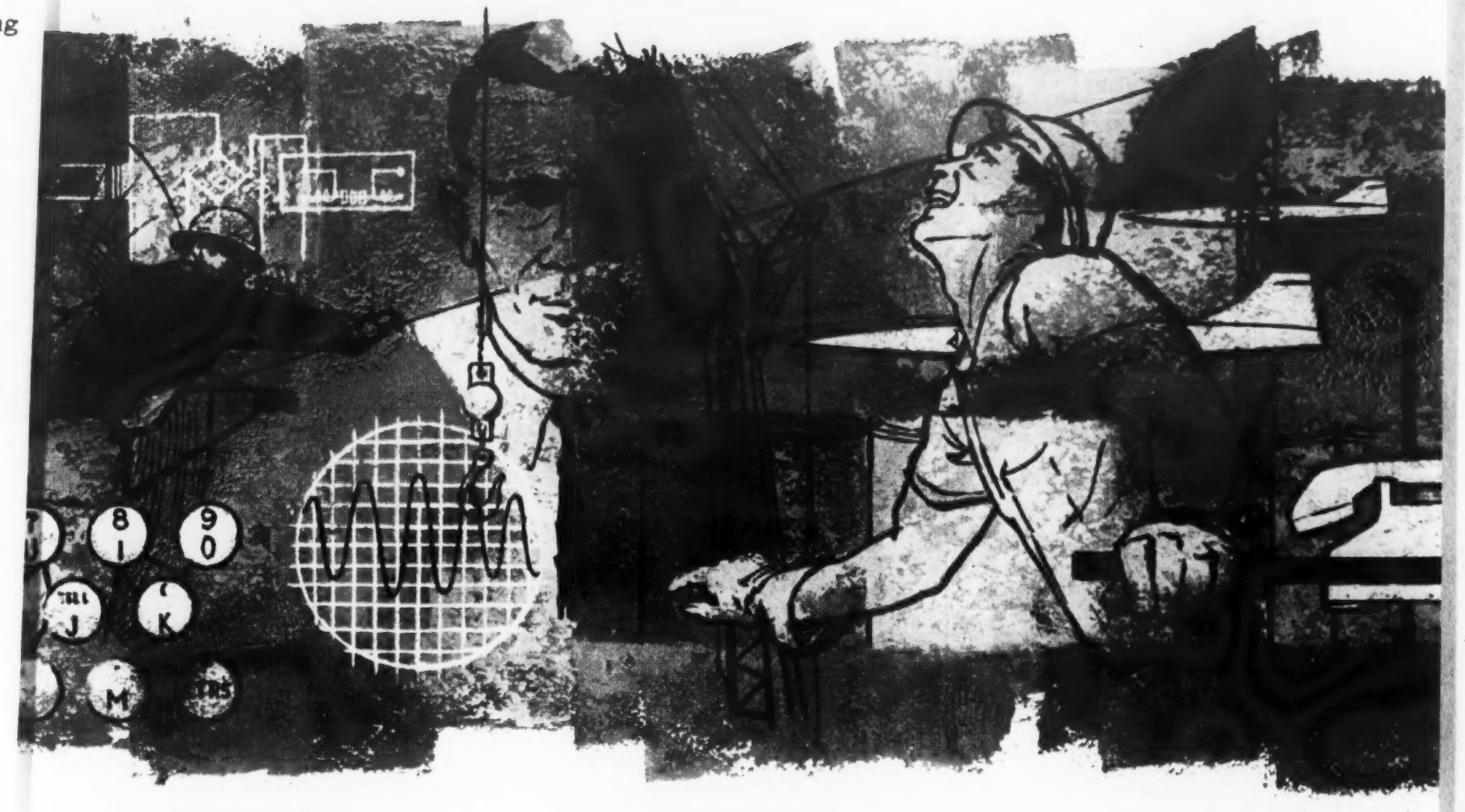
AN EXPERIMENTAL DOPPLER RADAR TORNADO detecting device is now being used as part of a project sponsored by the U. S. Dept. of Commerce Weather Bureau. Developed by Radiation, Inc., the device is a research tool to determine the feasibility of using Doppler Radar for tornado detecting and is now being modified to improve receiver sensitivity, reduce transmitter noise and eliminate transmitter mode skipping. A tornado has a unique Doppler Spectrum distribution and if the technique is proven, radar could then be used for warning. Last year a tornado was detected 23 miles away.

A SHOCK RESISTANT RADAR ANTENNA drive developed for the Navy by Illinois Tool Works has recently been introduced. The unit, a new gear system called "Spiroid," was designed and tested to withstand 90-knot wind shocks without failure. It consists of a conical pinion and a face gear. The drive gear set transmits ¾ hp at a 116 to 1 reduction and provides zero backlash control. It is the low incidence of backlash plus 10 teeth in contact at all times that permit the gears to withstand the high shock loading.

A NUCLEAR MAP delineating the current world nuclear activities is featured in the Stanford Research Institute JOURNAL, First Quarter 1959, in conjunction with an article on the status of the Atoms-for-Peace program by Ashton J. O'Donnell. The map pinpoints peaceful uses of the atom, and includes member nations of the International Atomic Energy Agency, deposits of uranium and thorium ores, radioisotope facilities, research and power reactors. Extra copies of this map, 3' wide, may be obtained for $3.00 from the Public Relations Office, Stanford Research Institute, Menlo Park, Calif.

RESEARCH AND DEVELOPMENT ON MISSILES AND SPACE VEHICLES are described in a new booklet available from General Electric. Covering the major areas of organization, facilities, capabilities, current projects and other activities, the booklet shows how a modern research and development organization must equip itself for work in the ultra-modern area of missile and spacecraft research and development. Entitled General Electric's Missile and Space Vehicle Department, free copies may be obtained from: General Electric Co., M&SV Dept., Room 5C, 3198 Chestnut St., Phila. 4, Pa.

ALPHA



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To broaden and extend its systems projects services in keeping with the space age . . . Collins Radio Company has created Alpha Corporation . . . a wholly-owned subsidiary to be staffed initially with Collins specialists and executives.

For a number of years, Collins has been engaged in a concentrated program of design, engineering and installation of complex communication systems for both military and commercial uses. This program has resulted in the development of technical skills, management techniques and know-how representing a significant addition to the company's primary activity of developing and manufacturing individual units of electronic equipment. Alpha has been formed to expand upon Collins activities in this field.

Alpha, with its highly specialized systems management organization of designers, engineers, scientists and constructors, will produce complete, packaged commercial and government installations in this country and abroad . . . using the best available equipment from industry to deliver to its clients turn-key installations meeting the highest standards of dependability and quality . . . ready for operation.

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Association affairs

Cook's Dr. Downing Honored by von Braun. Dr. J. Robert Downing, Director of the Cook Technological Research Center, receives a certificate of achievement for his work in the Army's Guided Missile Program from Dr. Wernher von Braun, Director of Development Operations for the Army's Ballistic Missile Agency. The presentation was made in April at the Cook Technological Center in Chicago. Cook Electric is AFCEA's first Sustaining Member.

New Group Members

Adler Electronics, Incorporated

Adler Electronics, Incorporated, One Le Fevre Lane, New Rochelle, New York, has joined the AFCEA group membership. This concern is active in the design, manufacturing and engineering of all phases of communications, repeating and relaying systems, precision test equipment, ground support, studio control equipment, and transportable systems.

The company representatives in AFCEA will be: Benjamin Adler, President; Alfred Strogoff, Vice President; Alwyn L. Carty, Jr., Director of Contracts; Jerome Friedman, Director of Customer Relations; Harold Kaye, Project Engineer; Bernard Klibaner, Project Engineer; Sheldon Newberger; Carmen Auditore; Walter Bieber; William Harnack.

Scanner Corporation of America, Inc.

The Scanner Corporation of America, Inc., located at 30595 W. Eight Mile, Livonia, Michigan, has become a new group member of AFCEA. This firm is engaged in engineering, design, development and manufacturing of electronic and electro-mechanical devices.

Representatives to AFCEA will be: R. J. Holland, President; W. J. Kelly, Vice President and Director of Engineering, and L. R. Brown, Chief Engineer.

New Region E Vice President

Walter H. Pagenkopf, Vice President of Operating, Teletype Corp., is the new AFCEA Region E Vice President. Mr. Pagenkopf, who is a Teletype Corp. group representative, succeeds John R. Howland who recently was appointed Sales Manager-Closed Circuit Television and Product Control Equipment, for Philco Corporation's Government and Industrial Division, Philadelphia, Pa.

Region E includes Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming and Colorado.

Gold Medal Honor Award

Air Force ROTC Cadet Michael Waynik has been named recipient of the AFCEA Gold Medal Honor Award by the Department of Air Science at the University of Pittsburgh.

NEW MEMBERS

Listed below are new members of the AFCEA who have joined the Association during the month of April. Members are listed under the Chapter with which they are affiliated. The May listing will appear in the July issue.

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A-2C Charles V. Briese
Anthony D. Carnevak
Lee H. Roan

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Lt. Col. Robert N. McNitt

BALTIMORE

Richard W. Henderson
George B. Reidy
Edward A. White

BOSTON

Reed Vail Bontecou
Norman L. Harvey
John B. Hawkes
George H. Gage
Frank K. Smith
Julius Dorfman

CHICAGO

Jack L. Cappels
Bruno Kucinski
Barney F. Cieslak
Maj. Louis P. Fuerst
Milton S. Kiver
James G. Matt
Lt. Cdr. Kenneth J. Baird
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Earl V. Eichenlaub

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George W. Barnes
Bryant J. Baum
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Donald L. Bess, Sr.
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James R. Sebern
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Lcdr. Joseph A. Grantham, Jr.
Donald M. Bekins
Earl A. Nielsen
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Robert D. Owskey
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Lorrin F. F. Chu
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Myer S. Bornstein
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Paul R. Deutsch
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SOUTH TEXAS

Col. Cornelius E. McBrayer
L. H. Hudson

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Hugh A. Young
Robert G. Clabaugh
Charles F. Brown
H. A. Norby
Cdr. Irvin H. Bordihn
Joseph H. Leiper
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TINKER-OKLAHOMA CITY

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Maj. James W. Rogers
Walter R. Howell, Jr.

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Robert J. Weiss

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Maj. Blaine O. Vogt
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George B. Stoner
Lt. Cdr. Herbert B. Rickards
Stephen J. Lanigan
William B. Bernard
Charles A. Weeks

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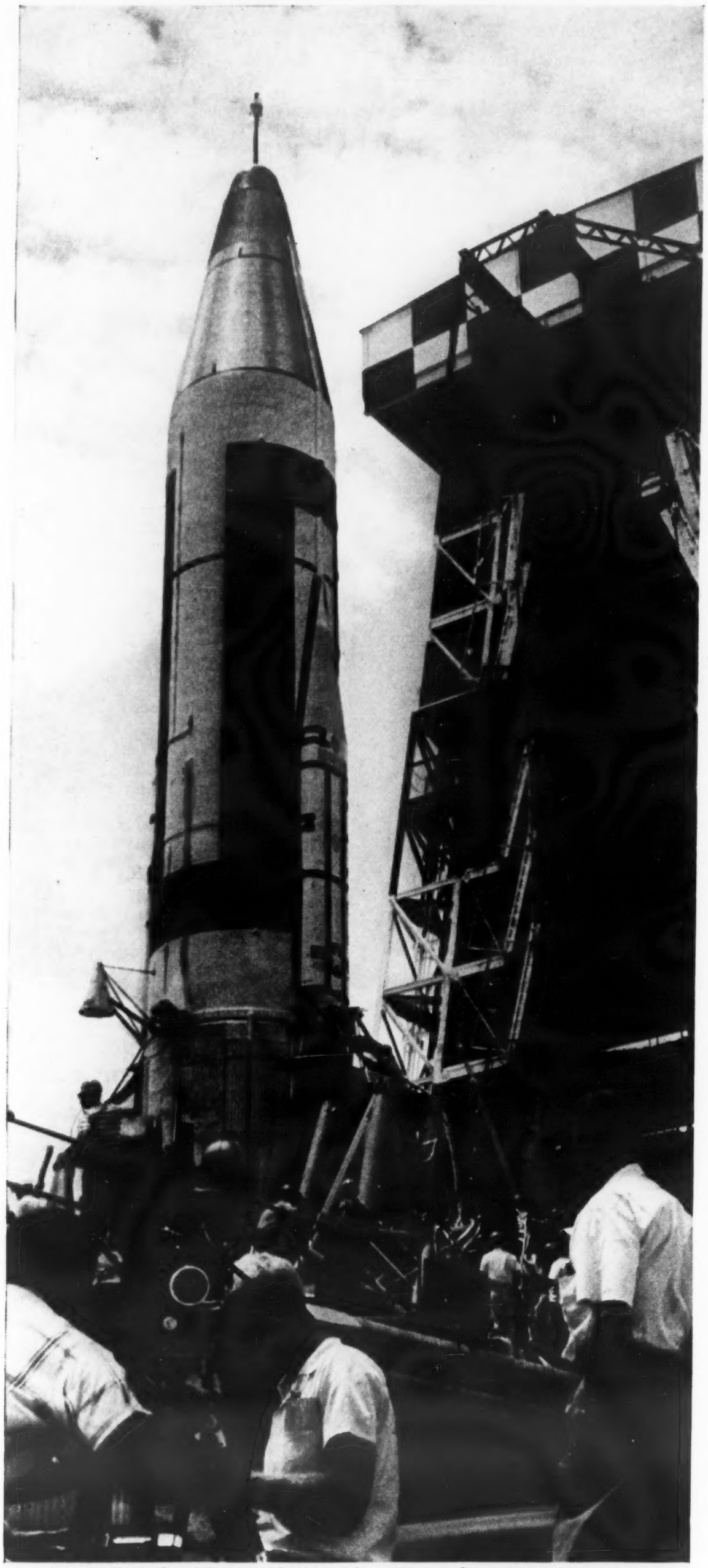
R. S. Unbehend, Syracuse, N. Y.
Andrew Longacre, Fayetteville, N. Y.



Atlas missile, built by Convair (Astronautics) Division of General Dynamics Corporation as prime contractor.

RCA ELECTRONICS CUTS DOWN THE COUNTDOWN

To our missile experts, "is it ready" is almost as important as "how far can it go." For retaliatory power, missile crews must be able to launch a maximum number of missiles in rapid fire order.

America's intercontinental ballistic missile, the Atlas, had already proved itself for distance on a 5500-nautical-mile range. But checkout and launching took several hours. So the next step in turning the missile into an operational weapon was to make it ready for quick action. RCA was selected to build an electronic system that would radically reduce the countdown time at the Atlas Operational Bases now under construction.

Now, in a matter of *minutes*, this elaborate electronic system can determine if any part needs attention—or signals that the missile will be ready to go.

This automatic checkout equipment and launch control system for the Atlas is one more of the many ways in which RCA Electronics works to strengthen our national defense.

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Chapter News

Arizona

AFCEA Regional Vice President Ray Meyers of Lockheed Aircraft addressed the April 21st dinner-meeting which was held at the Fort Huachuca Officers' Mess.

For the convenience of any members of AFCEA who may visit Fort Huachuca, the chapter wishes to inform them that the Fort Huachuca Officers' Club has a car rental service available to members and guests of the club. These cars are available by the day, week or month at standard rental rates.

Atlanta

Principal speaker at the March 31st meeting was G. Stewart Paul, Vice President—Operations, Western Union Telegraph Company, New York, who discussed the latest developments in private wire service and integrated data processing. Program chairman was E. P. Crutchfield of the Atlanta Office of Western Union.

During the business session, AFCEA Regional Vice President W. Kelly Mosley, on behalf of the Atlanta Chapter, presented a lifetime membership to Gerald Ghertner, General Manager of Cullon & Ghertner Co., printers and lithographers, in recognition of his outstanding contribution to the chapter over the years.

The dinner-meeting took place at the Fort McPherson Officers' Club with two hundred and thirty-one members and guests present.

Augusta-Fort Gordon

Transportable Single Sideband Communications equipment was the subject of discussion at the regular monthly meeting of the chapter held at Buck Lodge on Mirror Lake on April 21st.

Following a cocktail hour and a buffet dinner, Walter Bieber, project manager of Adler Electronics Co., New Rochelle, N. Y., spoke on the intricacies of the Single Sideband Communications System (AN/TSC-16). He was assisted in his demonstrations by Robert H. Weber, also of Adler Electronics Co., and Harold Winters, of the Technical Materiel Corp.

During the evening, AFCEA members were given the opportunity to inspect the AN/TSC-16, latest addition to the Army's fast growing communications network.

Augusta-Fort Gordon—Shown at the April 21st meeting are, left to right: L. C. Phillips of Southern Bell, chapter vice president; Walter Bieber, Project Manager for Adler Electronics, who was guest speaker; and Col. John J. Fettig, USA Unit Training Group Chief, Fort Gordon.

Baltimore

The U. S. Coast Guard was host to the members and friends of the chapter at its Curtis Bay Yard. The visit included a tour of the Yard, the Electronics Shop and the Boat Shop, including fibreglass and wood boats.

There was also an inspection trip aboard a 95-foot Patrol Boat, a 180-foot Buoy Tender, the Firebush, and the 327-foot Ocean Station Ship, the Duane.

Dinner and a social hour followed the tour.

Boston

Col. Sidney S. Davis, Signal Corps, USAR, Professor of Military Science and Tactics at Northeastern University and a former vice president of the Baltimore Chapter, was elected president of the chapter at the April meeting.

Elected with Col. Davis were: vice presidents—Col. Edward Rigney, USA (Ret.), Vice President of Trans-Sonics, Inc.; Willard D. Whitfield, Director, Office of Civil Defense, Harvard, Mass; Louis J. Dunham, Jr., Director, Franklin Technical Institute, and Frank Lyman, Jr., President, Cambridge Thermionic Corporation.

Continuing as secretary and treasurer, respectively, are William Melanson, Vice President, Cambridge Thermionic Corporation, and Vernon T. Adams, Western Union Telegraph Company.

To serve as directors next year are the following past presidents: Capt. Raymond B. Meader, USNR (Ret.), New England Telephone and Telegraph

Boston—New officers for 1959-60 are shown above after the annual elections on April 9th. Seated, left to right: William Melanson, Thermionic Corp., secretary; Col. Edward Rigney, Trans-Sonics, Inc., vice president; Col. Sidney S. Davis, PMS&T, Northeastern University, president; Willard D. Whitfield, Office of Civil Defense, vice president; and Vernon T. Adams, Western Union, treasurer. Standing, left to right: Col. M. D. Harris, USA(Ret.); Robert B. Richmond, General Radio Co.; Capt. Raymond B. Meader, USNR(Ret.), New England T&T Co.; all of whom were elected directors. Next are Louis J. Dunham, Jr., Franklin Technical Institute, vice president; and Fred E. Moran, Western Union, director.

Chicago—Col. Albert J. Mandelbaum, Signal Officer, Fifth U. S. Army, is shown addressing the April 2nd meeting of the chapter held at the Bell and Gossett Company plant in Morton Grove. His subject was "The NATO Signals Infrastructure Program."

Company; Fred E. Moran, Superintendent, Boston Western Union Telegraph Company; Col. M. D. Harris, USA (Ret.), and Robert B. Richmond, New England District Sales Manager, General Radio Co., retiring president.

Following the election of officers, Walter Levenson of the Itek Corporation presented an illustrated talk on aerial reconnaissance as a source of raw intelligence data. New techniques of data gathering, reduction, and analysis were discussed and Mr. Levenson lifted the horizon on potentialities now foreseen in this field, as camera resolution ability is improved.

Chicago

Col. Albert J. Mandelbaum, Signal Officer, Headquarters, Fifth U. S. Army, was the guest speaker at the April 2nd meeting of the chapter.

Harold A. Lockhart, Vice President (Engineering) of Bell & Gossett Company, was host for the meeting. In the absence of Chapter President Henry J. McDonald, Raymond K. Fried, past president of the chapter, called the meeting to order at Bell & Gossett Company's main plant at Morton Grove, Illinois. In addition to the guest speaker, he introduced Curtiss R. Smith, Vice President (Industrial Relations and Personnel) of Bell & Gossett Company, who presented a short talk on the history of the host company, and Arthur J. Schmitt, President of Amphenol-Borg Corporation, who described briefly the activities planned for the forthcoming meeting to be held at his company's plant.

Col. Mandelbaum, formerly Chief of Telecommunications for the Signal Division of Supreme Headquarters Allied Powers, Europe (SHAPE), employed colored slides to dramatize his talk on "The NATO Signals Infrastructure Program." (SIGNAL, Sept. 1958, p. 14.) He described in detail the fixed signal installation program supporting the Allied Command, Europe (ACE), military communications requirements.

The evening's activities were concluded with guided tours of Bell & Gossett Company's facility.

Dayton-Wright

Maj. Edward L. Brown, Chief of the Crew Stations and Research Section, Engineering Psychology Branch of the Wright Air Development Center's Aero Medical Laboratory, was the guest speaker at the April 16th dinner-meeting. Major Brown, a well qualified speaker on this subject, gave an excellent lecture on "Human Performance During Zero G." His interest in weightlessness and extensive research since August 1955 was indicated in no uncertain terms in the pictures and assisted him greatly in getting across to the audience the effects of short periods of zero gravity on human performance and behavior.

A slightly modified Convair C-131B transport aircraft is utilized for these experiments. Major Brown pointed out that by adding a specially modified sensitive gravity meter for the pilot to use in holding the required gravity, readings for the various parts of the maneuver was extremely helpful and are now standard equipment on all flights. This makes it possible for the pilots to fly this instrument to within 0.05 G. The instrument, he pointed out, is important for holding zero gravity and also for guidance so no more than 2½ G's are pulled during the entry to the maneuver and during recovery.

Major Brown further pointed out that with the space available in the C-131B transport, it has been possible to conduct a number of interesting experiments that have not been possible in the fighter-type aircraft. The most interesting experiment is one in which the human subjects are allowed to float, without restraint of any kind, in the aft portions of the cabin during the zero gravity periods. With the space now provided, human subjects can study problems such as orientation and individual propulsion during a zero gravity condition. With a little practice it is possible to maneuver about in this area as though it were filled with water, the Major stated. While the swimming-type motions are not immediately effective as they are in water, motion pictures indicated that swimming type motions appear to be useful and cause the body to change direction and accelerate. He pointed out that it is possible to tumble over and over in this space during the zero gravity period.

Held in the new ballroom of the Wright Patterson AFB Officers Club, the meeting drew an attendance of 125 members and guests.

Decatur

The chapter was visited recently by W. B. Goulett, AFCEA Executive Vice President, who gave an account of As-

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sociation affairs at a meeting held at the Decatur Elks Club.

Current enrollment in the chapter's electronics night school is 110. Courses now being taught are: AC-DC theory and electron tubes; radio transmitters and receivers; carrier wave communications; television theory, and television lab. Each course lasts twelve weeks, one night a week for three hours.

Fort Monmouth

Dr. Willy Ley, noted authority on rockets and outer space, was featured speaker at the chapter's April 23rd meeting.

Excerpts from a report in the "Asbury Park Press" are:

"Willy Ley, rocket research expert, said last night, the United States will probably put a manned satellite into orbit by early 1961.

"Dr. Ley addressed about 500 persons at the monthly meeting of the Fort Monmouth Chapter of the AFCEA at Gibbs Hall.

"Dr. Ley also outlined the development of artificial satellites since Sir Isaac Newton first suggested the feat was possible in 1687. He also discussed the nation's satellite program for the next two years.

"The scientist, who refers to a manned satellite as 'a satellite with people in it,' said a man will be sent into the void 100 miles above the earth in an X-15 plane 'in a few months.' From this experimental flight he then traced the program for putting a large, manned space station into orbit around the earth.

" 'Then the conquest of space will really begin,' he said. He predicted that a manned space station will be in orbit within the next six or seven years.

"Dr. Ley said the United States would have had a satellite in orbit by early 1956 — 18 months ahead of Russia—if the original 1954 satellite project, Orbiter, had not been dropped.

"After a manned satellite, an 'airplane-shaped ship' with a pilot will go into space and land back on earth, the scientist said. This will be within three or four years, he said.

Fort Monmouth—Willy Ley (left), rocket research expert who was guest speaker at the April 23rd meeting, is being greeted by Col. Alvin L. Burke, chapter president.

"Dr. Ley said the satellite program for the next few years includes orbiting of meteorological, navigational, communication, and television broadcasting satellites.

"At least 16 such specialized satellites will be put into orbit, Mr. Ley said.

"Dr. Ley, who is a professor of science at Fairleigh-Dickinson University, said it is possible the Russians may put a man into orbit before the U. S.

" 'We let the Russians go ahead in developing very heavy rocket motors. They may have developed them for a project never finished. I feel that the Russians are not ahead of us in general missiles . . . but in propulsion for ICBMs and satellite carriers, they are ahead of us,' he said.

"He estimated the Russian satellite program was about 18 months ahead of this country's.

" 'Some rocket experts say we are in for a five-year race,' Dr. Ley said.

"Dr. Ley said one of the major questions scientists were concerned with in 1948 was whether the various stages of a multiple-stage rocket could be separated and ignited while in flight. He also discussed solid and liquid rocket fuels, gravity, and other problems rocket developers were faced with.

"Dr. Ley was born in Germany. He came to this country in 1935. He has written many books on rockets, missiles, and space travel. Some were written in collaboration with rocket expert Wernher von Braun."

Gulf Coast

The White House Hotel was the scene of the chapter's April 6th dinner-meeting which was attended by forty-seven members and guests.

The evening's program was conducted by Harry Biggs of Southern Bell Telephone and Telegraph Company, Jackson, who gave a slide-illustrated presentation on 4-A switching equipment and direct distance dialing.

Nominations were completed for new officers for 1959-60, with the election to be conducted by mail ballot.

Kansas City

Charles A. Kinsley, Manager, Correspondence Service, Sales Service Division of Eastman Kodak Company, Rochester, New York, presented a discussion on photography at the March 26th meeting. His talk was supplemented with 180 color slides which, in some instances, compared pictures which were taken using various types of photographic equipment and techniques.

The group was told about the advantages of using filters, different types of lens, flash guns, flash lamps, backlights, time exposures, etc. For instance, sky-light filter adds additional warmth, and polaroid filter increases saturation of many colors, thereby deepening the color hues. A short time exposure is used for pictures where a flash is unsatisfactory. Mr. Kinsley mentioned many other procedures employed by professional photographers which can also be useful to the amateur.

The speaker said that one of the fundamentals in effective picture taking is planning ahead. Some types of equipment are particularly essential for certain locations and climates. By knowing this and planning accordingly, the photographer can get better pictures.

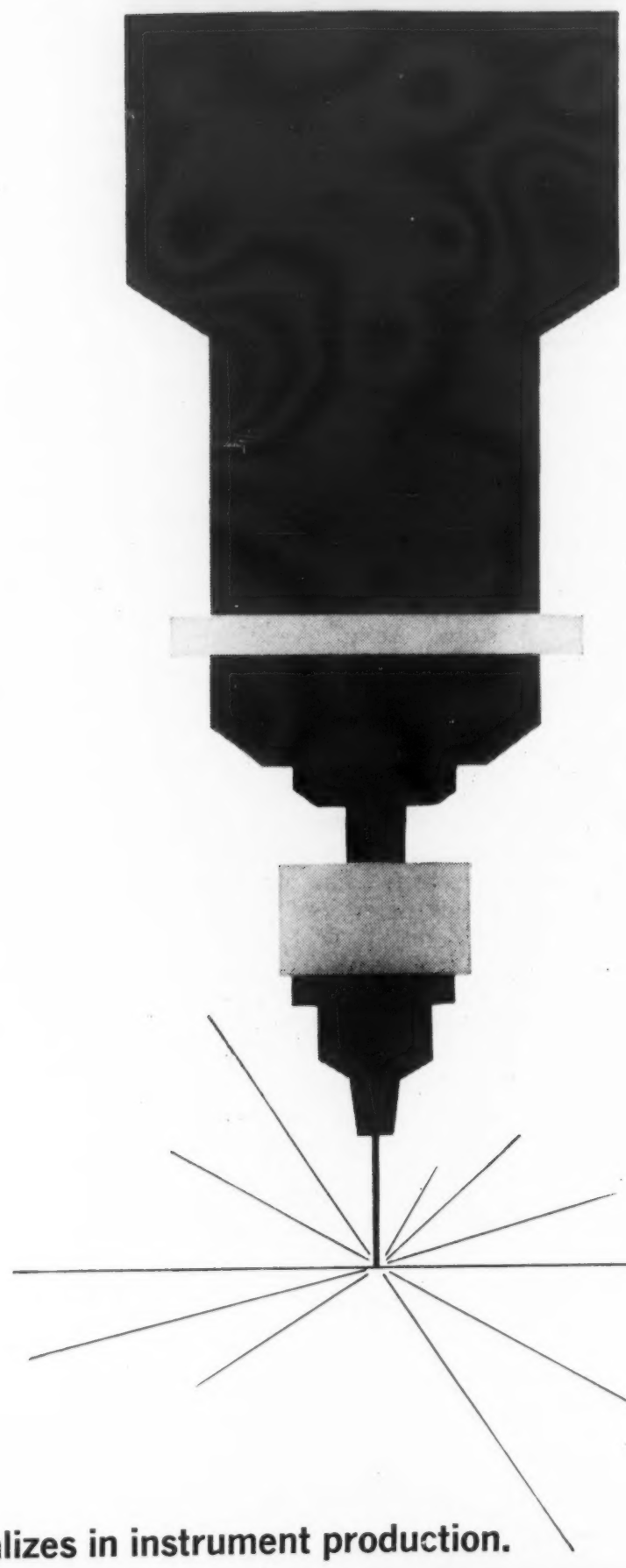
Another fundamental which Mr. Kinsley pointed out is that the photographer should avoid complicated subjects. In the majority of cases, a simple picture, with one or two points of interest, is more effective than a picture having several different subjects which tend to clutter the picture and confuse the viewer.

The kodachrome and ectochrome pictures displayed around the room further illustrated the results of techniques which Mr. Kinsley explained to the group. These pictures were some of the pictures which are to be displayed in the Eastman Kodak Company Exhibit in a forthcoming International Exhibition.

The April 23rd meeting was addressed by John A. Bowman, Special Projects Manager, Long Lines Department, American Telephone and Telegraph Company.

Mr. Bowman's presentation, "Voices Under the Sea," was divided into three parts. The first part of his speech was about the origin of the first Trans-Atlantic Cable, which was completed in 1956, and subsequent cables. Prior to 1956, there had been telephone service to overseas points. However, this service was by radio and, during severe weather conditions, transmission of voices was very poor. Also, there were were only a few circuits available. Because of the growing business and defense needs for communications between continents, it was felt that an underwater cable could be used to satisfy these needs. A favorable aspect of the underwater cable is that the possibility of service interruptions is extremely remote. The Trans-Atlantic Cable project was participated in by the Canadian Carrier Corporation, the British Post Office, and the American Telephone and Telegraph Company.

The second portion of the speech was in connection with manufacturing and installation of the cable, and difficulties incurred in the installation period. This portion of the speech was supplemented by slides. Mr. Bowman said that many days of research were spent in developing the type of cable which could best withstand the weather conditions and ocean currents and still operate to the optimum. In installing the cable, it was necessary to make sure that it was installed in the proper place. To do this, scientists checked to see that there were no earth faults or icebergs at the place where the cable was to be installed. Also, they had to determine which places would be least susceptible to earthquakes. Another



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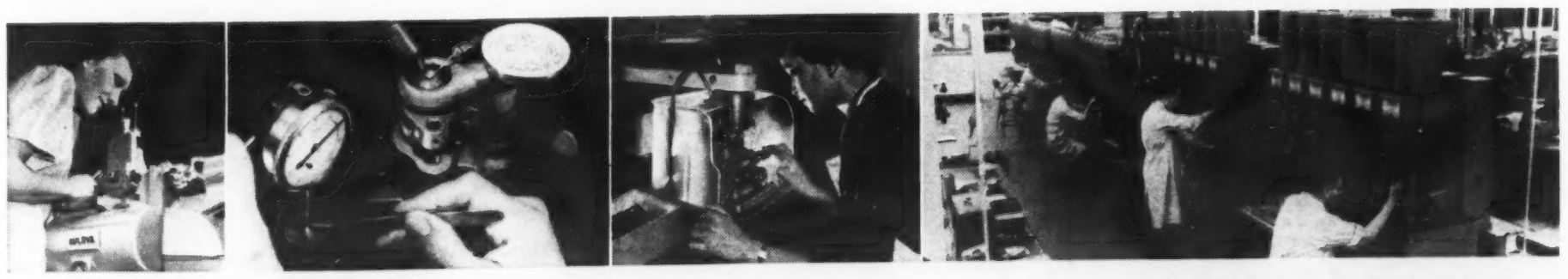

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BULOVA

factor which had to be considered in installing the cable was that the equipment used by fishing boats could disrupt the cable. Consequently, popular fishing spots were avoided.

The third portion of Mr. Bowman's presentation was a film which gave the story on the recent cable break of the first Trans-Atlantic Cable. This cable break occurred in the proximity of Clarenville, Newfoundland, and it is believed that it was caused by trawlers which were fishing in that vicinity. Within three days, the cable break had been located, repaired, and service had resumed.

Special guests at the meeting, which was held at the Officers Club, Richards-Gebaur AFB were: Brig. Gen. and Mrs. W. W. Bowman, Vice Commander, Central ADF, Grandview, Mo., Mr. and Mrs. A. J. Esrey, General Manager, Western Area, American Telephone and Telegraph Company, Kansas City, Mo.

London

A conducted tour of the M. O. Valve Company Ltd. works at Hammersmith was given to some 120 members of the chapter and their guests. This was followed by a cocktail party and dinner at the Clarendon Hotel. T. W. Heather, M.C., Chairman of the M. O. Valve Company Ltd., was guest speaker.

Mr. Heather reviewed the history of the M. O. Valve Company Ltd., which was formed jointly by the General Electric Company and the Marconi Company, and described its growth in the transmitting valve field following World War I to the forefront of magnetron and cathode ray instrument tube production during World War II. He pointed out that in this growth the Research Laboratories of General Electric at Wembley had played a prominent part, coupled with the world-wide radio experience in equipment of the Marconi Company.

He went on to say that at the end of the war, with the advent of television, the decks were cleared to enter the so-called "entertainment market" on a considerable scale, but at a later date, it was decided that the Company should revert to its original form of concentration as leading exponents in the more highly technical field, covered by Industrial and Transmitting Valves for special purposes, and Cathode Ray Instrument Tubes. As the result of this policy the Hammersmith Factory is now manufacturing Travelling Wave Tubes covering a range from 2,000 to 6,000 mc/s., High Power Klystrons, High Quality Cathode Ray Instrument Tubes, and is probably the leading authority on large scale production of Backward Wave Oscillators.

Mr. Heather pointed out that although the visitors had seen some of the devices manufactured in the factory, the brief tour gave little idea of the things to come, particularly in the ultra-short wave field on which the Company is concentrating a major part of its effort.

Montgomery

The chapter held its regular monthly meeting and dinner at Maxwell AFB Officers' Club on April 21st.

The annual election of officers for the 1959-60 year was conducted with the following result: president — Lt. Col. Herbert Herman, Communications and Electronics Doctrinal Division, Air Command and Staff College, Maxwell Air Force Base, re-elected for a second term; vice president — H. B. Lackey, Assistant Vice President, Southern Bell Telephone and Telegraph Company, Birmingham; secretary-treasurer — Luther L. Hall, Communications and Electronics Doctrinal Division, Air Command and Staff College, Maxwell Air Force Base.

Directors—A. B. McFerrin, Vice President and Sales Manager, Stegall Sylvest Seed Company, Inc., Montgomery; S. W. Reese, Chief Engineer, Southern Bell Tel. & Tel. Co., Birmingham; C. S. Weiss, District Engineer,

London—A group of AFCEA members are shown during a tour of the M. O. Valve Company Ltd. works at Hammersmith which featured the chapter's March 19th meeting.

IRE Salutes Government Research

Again government projects make the news as space satellites relay world weather data and rockets orbit the sun. The *Institute of Radio Engineers* salutes government contributions to progress in radio-electronics in the *Special May Issue* of **PROCEEDINGS OF THE IRE.**

The big May **PROCEEDINGS OF THE IRE** gives deserved recognition to the government laboratories and bureaus engaged in electronics research and development, and brings to its readers information about the invaluable work being done by engineers and technicians in federal employ. Included are 40 technical papers dealing with the most important aspects of current projects.

Radio-Electronics Behind the Headlines

This Special Issue reveals how the government is meeting the challenge of creating new and better electronic devices for peaceful and utilitarian purposes, as well as how it is meeting the pressing need for advanced national defense systems. Also discussed are future safeguards for the security of the free world.

Presentation of this special issue on *Government Research* is in keeping with the IRE's policy of bringing to the world of radio-electronics the latest news of subjects of special interest and significance. Such a practical policy enables the IRE to provide a valuable service to the industry by making technical material and pertinent information available not only to its 72,000 members, but to informed non-members as well.

Read this informative report on *Government Research* in the publication that records progress. If you are not a member of the IRE, be sure to reserve a copy of the May **PROCEEDINGS,** now.

PARTIAL CONTENTS OF THIS GOVERNMENT RESEARCH ISSUE:

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"The DOFL Microelectronics Program" by T. A. Pruge, J. R. Nall & N. J. Doctor, Diamond Ordinance Fuze Labs.

"VFL Propagation Measurements for the Radux-Omega Navigation System" by C J. Casselman, D. P. Heritage & M. L. Tibbals, U. S. Naval Electronics Lab.

"Submarine Communication Antenna Systems" by R. W. Turner, U. S. Naval Underwater Sound Lab.

"Some Characteristics of Persistent VHF Radio Wave Field Strengths Far Beyond the Radio Horizon" by L. A. Ames, E. J. Martin & T. F. Rogers, Air Force Cambridge Research Center

"Phenomena of Scintillation Noise in Radar Tracking Systems" by J. H. Dunn, D. D. Howard & A. M. King, U. S. Naval Research Lab.

"On Models of the Atmospheric Radio Refractive Index" by B. R. Bean & G. D. Thayer, National Bureau of Standards

"Image Intensifiers and Image Converters for Military and Scientific Use" by M. W. Klein, Engineering Res. & Dev. Labs.

"A Light-Weight and Self-Contained Airborne Navigational System" by Staff, Defense Research Board, Canada

"The CAA Doopler Omnirange" by S. R. Anderson & R. B. Flint, U. S. Dept. of Commerce

"Pulsed Analog Computer for Simulation of Aircraft" by P. N. Herzog, U. S. Naval Training Device Center

"Progress and Problems in Army Communications" by R. E. Lacy, U. S. Army Signal Res. & Dev. Labs.

"The Engineering of Communication Systems for Low Radio Frequencies" by J. S. Belrose, W. A. Hatton, C. A. McKerrow & R. S. Thain, Defense Research Board, Canada

"Numerical Approach to Electronic Reliability" by J. J. Naresky, Rome Air Development Center

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REMEMBERS THE MAN

All IRE members will receive this May issue as usual. Extra copies to members, $1.25 each (only one to a member)

Southern Bell Tel. & Tel. Co., Montgomery; Col. Sterling K. Briggs, Director, Communications-Electronics, SAGE, Gunter Air Force Base; Col. William H. Lyle, Chief Communications and Electronics Doctrinal Division, Air Command and Staff College, Maxwell Air Force Base; Maj. George W. Mosall, Communications and Electronics Doctrinal Division, Air Command and Staff College, Maxwell Air Force Base.

Committees were selected as follows: program—C. S. Weiss; membership—James B. Fitzgerald, Division Engineer, Alabama Power Company, Montgomery, and Col. Sterling K. Briggs.

New York

Dr. Miles J. Martin, Manager of Research Information for General Electric at Schenectady, spoke on "Research Looks Ahead" at the chapter's March 25th meeting.

Dr. Martin, well-known author and speaker, reviewed technological progress over the past half century and raised the questions, "Can this continue indefinitely?" "What of the next 50 years?"

Stating that the "output of research is knowledge" and commenting on the relatively short "shelf life" of such knowledge, Dr. Martin cited specific examples of present day research which may open new horizons. Dr. Martin's remarks left everyone present with the thought that we "ain't seen nothin' yet."

Executive Vice President W. B. Goulett was a guest of the chapter and gave a brief report on AFCEA activities.

North Texas

James C. Barclay, Defense Communications Manager, Western Area, American Telephone and Telegraph Company, Long Lines, Kansas City, was guest speaker at the chapter's February 27th meeting held at the Naval Air Station, Grand Prairie.

Mr. Barclay discussed the over-all communications problems and objectives involved in the SAGE project and augmented his talk with a film.

Northeastern University—Members of the student chapter recently visited the M.I.T. Computation Center. Maj. Mac E. Seldner, SigC, assistant advisor to the chapter, appears in the center. To his left are: Peter Reisz, vice president of the chapter's Division A; Richard Dwyer, Division A president; and members Robert P. Fischer, Cal Craft and Jerome Ryan. Demonstrating the control console of a 704 Computer are Robert Finnigan, a Northeastern student on co-operative employment at M.I.T., and Tony Sacco.

Northeastern University

Schedule of activities for Division B, included the following:

April 15th—talk on "The Army Pictorial Service" by Maj. Robert E. Reordan; April 22nd — tour of Sylvania Electronics Corp., Waltham; April 29th —talk on "Army Aviation and ROTC" by Maj. John E. Stanis; May 7th and 13th—helicopter flights at Fort Devens: May 15th — annual dinner-dance at Charlestown Navy Yard; May 20th—trip to Boston Navy Yard for tour of capital ship; June 3rd—trip to Boston Army Base for Boston Harbor cruise.

New officers for Division B were elected recently as follows: president—Harry Giberson; vice president — Stephen Baranowski; secretary — Robert Zaruba; treasurer—Richard Garvin.

Pittsburgh

Computer componentry was treated with particular emphasis by Dr. A. J. Perlis, Head of the Computation Center of Carnegie Institute of Technology, when he addressed the April 23rd chapter meeting.

Dr. Perlis' talk covered the military application of computers from a historical and functional standpoint, with stress on the application of computers in executive-type installations. The various components and integration of computer systems were discussed in the light of requirements for future design and construction.

Dr. Perlis, noted expert on computers, has been elected symposia coordinator for the UNESCO-sponsored First International Conference on Information Processing to be held in Paris, June 15-20. He is one of the thirteen computer experts chosen throughout the world to coordinate and conduct one of the symposia.

Rome-Utica

With some 100 electronic communications experts from Rome, Utica, Syracuse area present, the chapter held its April meeting in the new multi-million dollar WSYR Television and Radio Center here.

As guests of General Electric Company's Communication Products Department, military and civilian members of AFCEA were briefed on the latest developments in communication fields.

Rome-Utica—Pictured during the chapter's April meeting which was held in the new WSYR Television and Radio Center in Syracuse, are, left to right: R. O. Wright, Hoffman Laboratories, Rome; A. F. Wild, manager of military sales for General Electric's Communication Products Dept.; WSYR News Director Fred Hillegas; Brig. Gen. Donald P. Graul, USAF, Commander of Rome Air Development Center and a director of the chapter; and Richard Benoit, communications director of RADC, chapter vice president.

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Scott-St. Louis

Lt. Col. James C. Covington, USAF, Commander, 85th Fighter Interceptor Squadron, Air Defense Command, presented a program on "The Sonic Boom" at the chapter's April 3rd dinner-meeting. His discussion was supplemented by a North American Aviation film on the same subject.

The annual election of officers and directors was held, with Col. George A. Zahn, Hq. AACS, DCS/COMM, elected to the presidency for 1959-60. Others elected were: vice presidents—Elmer J. Weber, Southwestern Bell Telephone Company; Col. David W. Baugher, Missouri Air National Guard; secretary—Allan L. Eisenmayer, Base Communications, Scott AFB; treasurer—Kenneth H. Norris, Hq. MATS, DCS/Operations, directors—Louis E. Dechant, Dechant Electric Company; Rear Adm. Robert E. Melling, USN (Ret.); Laurence E. Miller, County Director, FCDA; B. R. Robards, Southwestern Bell Telephone Company; and Earl F. Hagen, American Telephone and Telegraph Company, Long Lines.

The gavel of office was presented to Colonel Zahn by Maj. Gen. D. C. Doubleday, member of the Board of Directors.

In accordance with the chapter's custom, the retiring president was awarded an AFCEA gold lapel button for his service to the chapter. Secretary Allan Eisenmayer made the presentation to B. Roger Robards, who served as president during 1958-59.

Seattle

The chapter's April 8th meeting featured a lecture-demonstration on "Stereo Hi-Fi" by Art Hartley, sales engineer for the Pacific Electronics Company of Seattle.

Mr. Hartley pointed out that while stereo was probably first introduced in Walt Disney's "Fantasia," it did not take hold in the home until just recently. Packaged stereo, a system contained in a single cabinet, he said, is not recommended because of the many detrimental aspects such as mechanical feedback from the speaker to the cartridge and the necessarily close proximity of the speakers to each other. "Component" stereo hi-fi, according to Mr. Hartley, was the recommended method of assembling a system. In this connection, he mentioned that in order to capture the true response of stereo hi-fi, good components must be used throughout. To skimp on any component would cause a loss in the system which would defeat the purpose of stereo hi-fi, he stated.

A demonstration followed with some recordings of moving vehicles, etc., which dramatically demonstrated the purpose of stereo hi-fi. A lively question and answer period was conducted at the end of the program.

Among those attending the dinner-meeting at the Benjamin Franklin Hotel was William Cruse, U. S. Office of Civil and Defense Mobilization, Everett, who was a special guest of the chapter.

Tinker-Oklahoma City

Approximately eighty-five members and guests attended the April 23rd meeting held at the Student Union Banquet Room of the University of Oklahoma. This was a symposium type meeting with two guest lectures. Loyd G. Dorsett, president of Dorsett Laboratories, Norman, Okla., and a past president of the chapter, was program chairman.

Dr. Robert W. McVickers, Dean, Graduate College of Oklahoma State University, spoke on "The Impact of Military Technology on Service Education." He stressed the need for continuing emphasis on higher education and the need for "educated" people in the numerous technical programs of the

Washington—The chapter's April 2nd luncheon-meeting honored Lt. Gen. James D. O'Connell, the retiring Chief Signal Officer of the Army. Above, John O'Brien of Hoffman Laboratories, chapter president, presents General O'Connell with a transistor radio.

(*Continued from page* 51)

Armed Services. He also pointed out the added requirements on the nation's educators and educational institutions in meeting this demand.

Col. Walter H. Clifford, Director of Missiles Testing, White Sands Missile Test Center, White Sands, New Mexico, spoke on "New Electronic Developments in Missile Testing." His talk on new electronic data collecting equipment was illustrated with a movie taken at White Sands called "Facts in Flight." He also spoke on the Nike-Hercules Missile and followed with a short film on these missiles.

Distinguished guests of the chapter were: Dr. Lloyd Swearington, Vice President of the University of Oklahoma; Dr. and Mrs. James Harlow, Dean, College of Education, University of Oklahoma; and Cdr. and Mrs. Downs, Executive Officer, Naval Air Technical Training Center, Norman, Okla.

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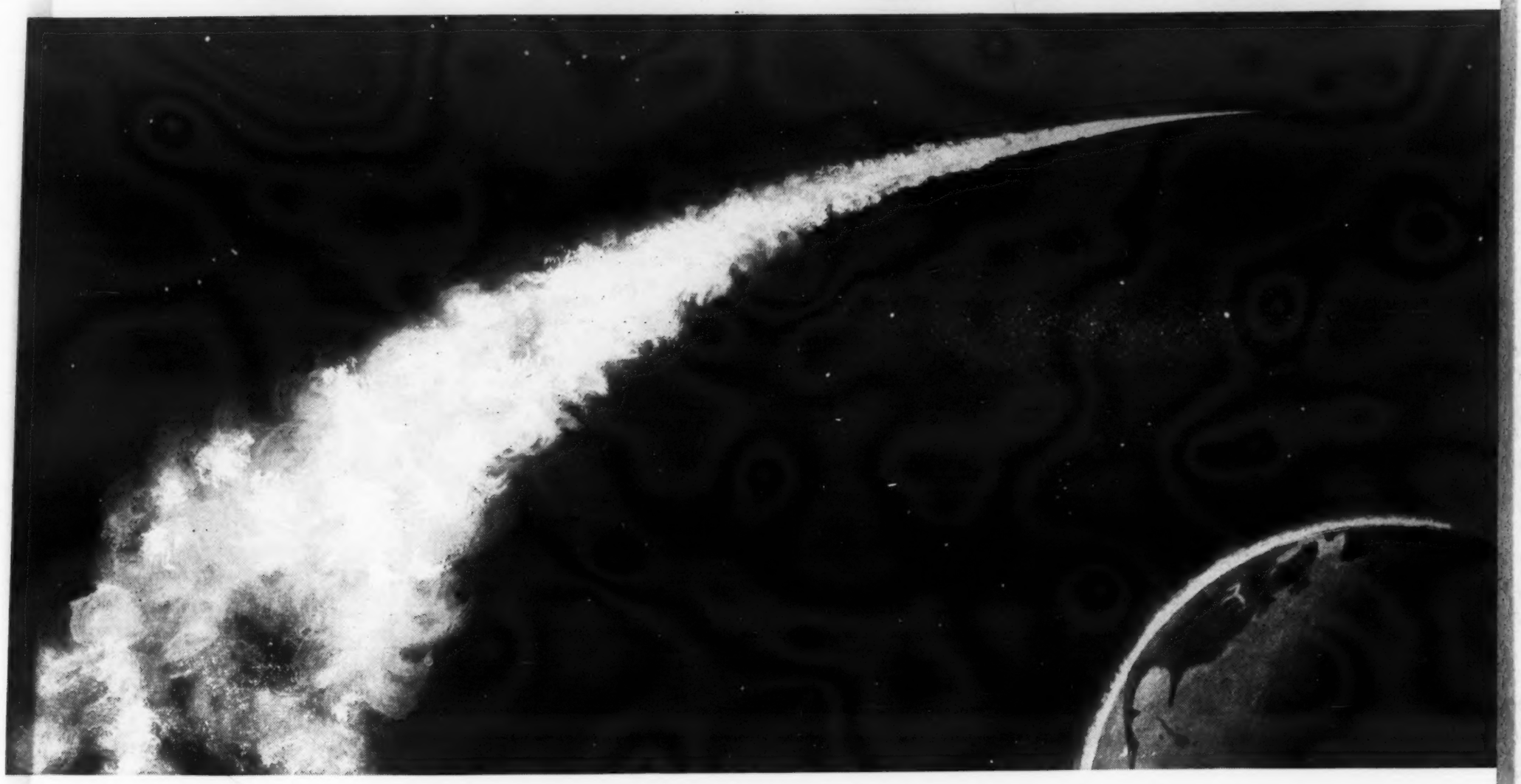
DYNA-SOAR



Dyna-Soar (for dynamic soaring) is a joint project between the Air Force and the NASA, and is an attempt to solve the technical problems of manned flight in the sub-orbital regions. Advance knowledge on the project indicates how a boost-glide vehicle can operate from the outer fringes of the atmosphere where it can maneuver and be recovered undamaged. Studies show that by varying the original rocket boost, and thus the velocity, and with the control available to the pilot, the Dyna-Soar aircraft can circumnavigate the earth, followed by a normal and controlled landing. Boeing Airplane Company, one of the competing companies for the development contract for the complete boost-glide system, has delegated to RCA the responsibility for the development of important electronic components of Dyna-Soar.

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Galileo Meets the M

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in the sunny Italian sky over Pisa and landed dire
of Galileo's telescope. Three creatures alighted fro
made straight for Galileo.

"Good morning Signor Galilei," they chorus
are . . ."

"Don't tell me, let me guess," interrupted t
Mars Brothers?"

"In the flesh, more or less," leered the green
brandishing a cigar. "I'm Sloucho. Sorry about
seem to have knocked off a Pisa the Tower."

the Martians

space ships suddenly materialized
nd landed directly under the nose
res alighted from the lead ship and

," they chorused in unison. "We

' interrupted the scientist. "The

ered the green one in the middle,
. Sorry about the accident. We
Tower."

"Good for the tourist trade," Galileo smiled.

"Now for business," went on Sloucho. "The boys upstairs are fascinated with your radar. They sent us down here to find out how you make it work without Bomac tubes."*

"I'm sorry to say it doesn't work at all," Galileo answered. "Or rather — it didn't, until the instant your ship hit the tower."

Sloucho's cigar was aquiver with excitement. "What happened then?" he asked.

"See for yourself," Galileo said, pointing a bony finger at the radar console. There, blinking crazily, like so many overstimulated lightning bugs, the tubes were actually spelling out a single, sure-enough word.

The word was "TILT."

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